Computer Chronicles Revisited

Volume 3 (1985 - 1986)

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Introduction

This ebook reprints a series of posts from my blog *Computer Chronicles Revisited*, which I launched in May 2021. Each chapter covers a single episode of the PBS series *Computer Chronicles* that aired during that show’s third season (1985-1986). There is an extended recap of each episode followed by analysis of what became of the people and products featured on the program. Each chapter then concludes with a miscellany section called “Notes from the Random Access File,” an homage to the news segment that followed most *Computer Chronicles* broadcasts.

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Chapter 1: David Crockett, Sam Colella, Deborah Wise, and David Norman

The third season of *Computer Chronicles* debuted in September 1985 with a two-part look at the "slowdown in Silicon Valley." Basically, these next two episodes consisted of round tables with people representing different facets of the computer industry to discuss why things seemed to be going much worse in 1985 as opposed to 1984. This first episode focused on the perspectives from venture capital, the media, analysts, and retailers, while in the next episode we'll hear from software and hardware manufacturers.

"Orphaned" Computers Highlighted Industry Downturn

Stewart Cheifet did his cold open standing outside a "shiny new building" in Silicon Valley–specifically, the Kifer Tech Center in Sunnyvale–which he said was supposed be the home of several new hi-tech startups. But the building was now vacant and the one next to it was unfinished and abandoned for the moment. Cheifet rhetorically asked what caused "the crash in computers" and would it last?

In the studio, Cheifet and Gary Kildall sat at their customary table. In front of them were two personal computers, an Osborne 1 and a Coleco Adam, which Cheifet said were now "orphans" in the computer industry. They were highly praised when they first came out for their new technology but were now no longer in production. Cheifet noted that all one seemed to hear these days about the computer industry was stories of disaster and failure. Cheifet asked Kildall for his perspective as someone who had started two tech companies, first Digital Research and now Activenture (later renamed KnowledgeSet).

Stewart Cheifet and Gary Kildall on the set of “Computer Chronicles.” On the desk in front of them is an Osborne-1 computer and a Coleco ADAM computer.

Kildall said there were a lot of components to the computer industry. For example, there were chip manufacturers like Intel, who were being hit hard by Japanese competitors on price. Commercial hardware systems, such as the Osborne, were in a market now dominated by IBM. In the home market, companies like Coleco never really established what people could do with a computer besides play games. As for the software industry, there had been growth, but that also meant growth in the number of suppliers, which had led to price erosion. Ultimately, Kildall said the way the industry would get out of this slump was by continuing to pursue innovation and new technology.

PC Industry Growth Slowed from 76 Percent in 1983 to an Estimated 4 Percent in 1985

Marking her triumphant return to *Chronicles*, Wendy Woods provided some B-roll narration setting the stage for this episode’s theme. She said Silicon Valley’s brief-but-tumultuous history was marked by unlimited optimism and brilliant innovations that brought companies sudden success–and frequent failure. And if continuing growth had cushioned Silicon Valley from America’s economic problems, the recent news was not so good.

In 1983, Woods said, worldwide sales of personal computers increased 76 percent. But in 1984 the increase was only 19 percent. And for 1985, analysts predicted growth would slow to about 4 percent. Losses among the two largest home computer makers through June 1985 surpassed $600 million. (I think Woods is referring to Commodore and Apple, but I can’t be certain.)

Woods said repercussions in related industries were equally severe. Canceled chip orders had created a backlog for semiconductor manufacturers, where sales had dropped 25 percent in the past year. And the number of U.S.-based computer makers declined from over 150 to about 40, with a similar drop among software producers.

While poor sales led to curtailed predictions and a bleak outlook, Woods said the reasons for the slump were not clear. The more expensive group of PCs aimed at the business market grew by 25 percent in 1984 while sales of machines under $1,000 showed no increase. At worst, Woods said, the industry’s new self-doubt was based on uncertainty about who was using the product (and for what).

As Number of PC Manufacturers Shrank, Focus Turned to Applications

This episode was all about the round tables. The first group had E. David Crockett and Sam Colella join Cheifet and Kildall in the studio. Kildall opened by asking Crockett, the president and CEO of market research firm Dataquest, about where the slowdown was actually occurring within the industry. Crockett said “slowdown” was something of a misnomer compared to what the industry had accomplished in the past 10 years. He noted that the personal computer industry was worth $26.3 billion and had grown 80 percent in 1984. He saw 1985 as more of a consolidation or pause before further expansion, but even now there were certain segments that continued to do well in 1985, such as business computers and higher-end PCs.

Kildall compared the situation to building a crest on a wave, and then when the crest broke it was a question of what to do with the extra resources. Crockett agreed, stating there was an over-capacity problem. At one point there were over 375 manufacturers and once demand caught up with supply, there was an adjustment period.

Cheifet interjected at this point, asking if this was a case where bad forecasting or bad management by the manufacturers caused them to become overloaded with inventory. Crockett said he didn't think so; rather, it was more due to the fact that no industry had ever grown at this phenomenal rate. He noted that the computer industry had grown at rates greater than what DataQuest's own predictions had thought possible. And that phenomenal growth rate "invited" a lot of people into the industry before the supply chain could catch up. For example, he said there was now 40-percent overcapacity in semiconductors, which forced some chipmakers to reduce prices as much as 85 percent since January 1985. Such price reductions in turn spurred demand for PCs as manufacturers could now offer better price-performance on their machines.

Kildall asked about the effect of IBM's dominance on the PC industry. How did that affect any industry slowdown? Crockett said it certainly played a role in the sense that IBM established its channels and reached a certain level before setting lower goals this past year. IBM had publicly announced in 1984 that it planned to triple its supply of computers, which Crockett said it did. But this year, IBM said it only expected a 20-percent increase, which Crockett said it would also likely meet.

Kildall then turned to Colella, a venture capitalist with Institutional Venture Partners, and asked for his views of the situation, noting that venture capital had started to dry up. Colella said there was an excess of investment. He said there were 375 companies in the business at one point due to "great expectations." Basically, anyone who could build a microcomputer got into the business. Anyone who offered a concept for the "next, better computer" could get funding. As a result, too many deals were funded in a rush to the market. And most of those startup firms ran headfirst into IBM. Colella said

IBM had the most impact on those fledgling companies. Today, the venture capital community now saw itself as over-invested and not very interested in new personal computer deals.

Kildall asked Colella what he looked for now with a small company in terms of growth. Collela said they looked for the same things they always looked for–a well-thought-out plan, a management team that understood the market, and an exciting new market niche. The key was really finding new markets that existing large companies were not paying attention to and establishing a beachhead there. Kildall observed the previous approach would have been to invest in a very broad-based market but now venture capital was looking towards narrower, vertical markets, such as medicine or law. Colella agreed. He added that it was now more about the application of the computer rather than the personal computer itself. People were looking for higher utility in their hardware. They wanted greater productivity that would help improve the bottom line for their businesses. These customers needed more "intellectual" help, and Colella said the venture-capital community was more interested in that area.

Cheifet asked Colella for more specifics–what kinds of applications? Colella said one example would be CD-ROM, in particular databases that were now only available online or distributed via paper. (Colella slyly acknowledged Kildall, whose Activenture focused on this area.) New optical technology made it possible to put those databases on a disk and use the PCs that people currently owned to perform data manipulation and database handling.

Kildall pivoted the discussion to the home market. Crockett said that in 1984, about 9 percent of U.S. households owned a personal computer. In 1985 it was up to 13 percent. But the growth tended to be more at the higher end of the market, i.e. systems priced above $500. And most people who owned home computers were using them for business and professional work. To become a true home market, Crockett said, would require more of the types of niche applications that Colella mentioned, such as a localized database that enabled transactions over the telephone. Kildall said this meant the right home application hadn't been found yet. Crockett said that was correct.

Cheifet asked if the current situation would be healthy in the long run–i.e., while it may hurt a little bit right now, we would end up with better-managed companies and a more fine-tuned industry. Crockett said he thought that would turn out to be true. He noted that it wasn't just personal computers; there were also probably three or four too many players in the peripherals markets, such as printers. The companies that managed to survive would have lower-cost manufacturing and better methods of distribution. So it would be healthy in the long run for the computer industry, just as it was previously in other markets such as automobiles.

Cheifet closed the segment by asking Colella when he thought when and how things would turn around in the computer industry. Colella replied the market was currently plateauing and that the latter half of 1985 and 1986 would be much stronger. We wouldn't see the dramatic 80-percent growth of previous years, but there would be an emergence of new applications and new peripherals that would make computers easier-to-use in both the home and business markets.

Business PC Sales Remained Strong Despite Home Market's Struggles

For the second round table, Deborah Wise and David Norman joined Cheifet and Kildall in the studio. Kildall opened by asking Wise, a journalist with *Businessweek*, if all this talk about a "slowdown" was just media hype or was it really taking place. Wise said it wasn't hype. There were a number of firms currently losing money. For example, Apple Computer–once the "darling" of the personal computer industry–had recently shut down several factories and laid off thousands of workers. And IBM was holding on to an unknown number of machines in its inventory.

Kildall followed up, asking Wise for her views on what caused the slowdown. Wise replied that it was oversupply. Companies had ramped up production expecting 80-percent growth rates to continue and now they had to slow it down.

Kildall then turned to Norman, the president of computer retailer Businessland (and the founder and former CEO of DataQuest), and asked if he saw the effects of this oversupply at the retail level. Norman quipped that he "wondered if he was in the same business," because Businessland's sales were up almost 200 percent in the first half of 1985 compared to the same period in 1984. Nevertheless, he conceded that the growth rate of the computer industry as a whole had slowed. But the business computer market was still growing by about 30 to 40 percent in 1985. Norman attributed that continuing growth to the dominance of IBM, which he estimated had about 70 percent of the market for business PCs (i.e., computers priced at $1,500 or greater).Kildall observed that the slowdown among suppliers and the growth of retail channels led to a situation where more and more suppliers were fighting to get shelf space. Norman agreed with that assessment.

Kildall asked if there was a noticeable "price erosion" taking place, meaning that even as the number of computers being sold continued to grow, the total value of the industry was somehow stagnant. Norman pushed back a little on this, stating he believed there was currently a 30 to 40 percent growth in "revenue dollars" in the business segment (as opposed to the home market).

Wise interjected, noting that even in the business PC market there had been a "squeezing of margins." A growing number of "gray market" PCs had forced retailers to cut prices on IBM machines. (I assume she's using "gray market" here to mean IBM PC compatibles.) She added that while Businessland may be doing fine, other retailers were really hurting. Norman agreed there were a number of competitive price pressures in the market, but on the other hand Businessland's margins were moving up. He said the average Businessland system sold for about $6,000, up from $5,000 just two years earlier. So even though semiconductor prices were coming down about 20 to 25 percent annually, the business professional continued to pay a premium for more memory, faster printers, and so forth.

Kildall tried to steer the conversation back to the home computer market. Norman said Businessland had never really been in the home market, and he personally had trouble understanding it. He said at this point, he didn't see the value in buying a computer for the home. Wise agreed the applications weren't there currently for the home market. But she said there was still increasing “hype” from home computer vendors, such as Atari and Commodore, trying to get things going for the upcoming Christmas season.

Drawing on his own experience as a software developer, Kildall asked about the effects or price erosion on software. He said that by distributing software through standard retail channels–where the distributor and the seller each takes their cut–the money just wasn’t there to develop software. Didn’t that also have a dampening effect on the entire industry? Norman agreed this was a problem for lower-priced software, which still required a significant amount of training and support at the retail level. However, just as with hardware, Businessland had seen success at the higher end of the market. For example, Businessland sold a computer-aided design (CAD) software package for $2,500. They weren’t focused on the $50 software packages.

Cheifet asked Norman to comment on the reports of recent struggles at another well-known computer retailer, Computerland, which was dealing with layoffs and potential bankruptcy. Why did Norman think they were having problems? Norman reiterated it came down to the differences between the business and home markets. Computerland focused on the latter, which was a “very soft” and “almost non-existent” market at the moment. Norman said it came down to companies doing their market research. He saw tremendous opportunities in emerging areas like integrated voice-data workstations and business software. But having 375 companies building the same basic IBM AT was not going to make for a successful company.

Looking ahead, Kildall asked Wise what would lead the industry to “take off” again. Wise said the next round of new promotions for the Christmas season would help spur the market. But it would still come down to new applications that made the machines more interesting.

Cheifet pressed Wise on the home market. Would people actually buy new home computers like the Amiga 1000 and the Atari 520ST? Wise said yes, although she didn’t expect massive growth. In the long run there would be new applications to draw in that 87 percent of households that didn’t currently own a computer. She added, however, that finding retailers to sell these machines would be a problem. Computerland was having a hard time finding a market for itself. A number of other stores were also dealing with bankruptcy as the result of reduced margins.

IBM and Microsoft Continued to Develop PC-DOS Standard

Stewart Cheifet presented this week's "Random Access," which is dated in September 1985.

- IBM and Microsoft announced a new long-term development deal to keep PC-DOS (i.e., MS-DOS) on the IBM PC line. Cheifet said the new deal meant that IBM would not move to a new proprietary operating system. That in turn should help "stabilize" the PC market as software developers could continue to rely on IBM's commitment to the current open hardware standard.
- Cheifet said there were now several online mortgage database services that could quote the best rates in a given area, calculate a borrower's monthly payments, and even advise a buyer how big a mortgage they could handle on their income. Cheifet said the three biggest online mortgage services were CompuFund, Loan Express, and ShelterNet.
- Seventeen new computer magazines were launched in the past eight months, Cheifet said, adding that advertising revenues were down at 9 of the 10 current leading computer magazines.
- Despite the slowdown in Silicon Valley, a number of foreign countries continued their efforts to lure tech companies from northern California. Cheifet said delegations from Austria, West German, the Netherlands, Thailand, and Switzerland had recently visited Silicon Valley. But the most successful efforts were from Scotland and Ireland, with about 300 U.S.-based hi-tech firms now located in those two countries.
- Paul Schindler reviewed *CataList* (Automation Consultants International, $250), a mailing list manager that integrated with over a dozen popular word processing packages to create form letters. Schindler said the program was "truly impressive" and had "the fastest sort I've ever seen."
- The Computer Arts Institute planned to open the first computer artist program in Corte Madera, California, in the fall of 1985.

- The computer system that ran the automated-teller system for Mellon Bank in Pittsburgh failed, meaning the machine couldn't recognize any customer account numbers. This meant during a 90-minute period, the machines started "eating" customer ATM cards–about 2,000 in total.
- A worker at a struggling Intel chip fabrication plant in Albuquerque, New Mexico, put up a Hopi kachina doll in response to low production yields. "Call it what you will," Cheifet said, but Intel now reported the New Mexico plant was its most efficient.

All Roads Lead to Venture Capital (or Politics)

Since this was a people-focused episode without any product demos, I'll briefly run down each of our four guests and what became of them:

- Earl David Crockett earned his master's in electrical engineering and computer science at Stanford University before completing a doctorate at the University of Illinois. He worked for IBM, where he helped develop early modems and CRT displays, before moving to Hewlett-Packard for nine years. He then spent four years at DataQuest, including two as president and CEO. Not long after his *Chronicles* appearance, Crockett founded Pyramid Technology Corporation, which manufactured minicomputers, and served as its president and CEO. By 1988, Crockett jumped to the venture capital world, fist with 3i Ventures and later as a founding partner with Aspen Ventures
- Samuel Colella was still relatively new to the venture capital world when he appeared on *Chronicles*, having started with International Venture Partners in 1984. In 1999, he co-founded Versant Ventures, a venture capital firm that focuses on the healthcare industry, where he remains managing director.
- As mentioned in the episode, David A. Norman actually founded DataQuest and served as its chairman and president until he resigned in March 1982 to start Businessland. While Businessland may have been doing great in the fall of 1985, things started to go bad when Norman signed a distribution deal with Steve Jobs in 1989 to carry the latter's NeXT computers. As Luke Dormhel noted in a May 2021 retrospective for the *Cult of Mac*, "By the end of the decade, Businessland had sold just 360 [NeXT] units. Even worse,

Businessland spent $10,000 for every NeXT Computer sold, due to forced investment in a dedicated sales and marketing team." In 1992, Businessland closed for good.

- Deborah Wise grew up in the United Kingdom before studying journalism in the United States. She spent nine years covering Silicon Valley for *Business Week* and other publications before moving to Paris to ghostwrite the autobiography of a well-known French flutist. In the 2010s, Unger worked for Transparency International, an anti-corruption nonprofit organization. In 2017, she ran as the Liberal Democratic Party's candidate in the United Kingdom general election, losing to former Conservative Party leader and cabinet minister Iain Duncan Smith.

Notes from the Random Access File

- This episode is available at the Internet Archive and has an original broadcast date of September 3, 1985.
- New season, new sponsor: The now-defunct American Federation of Information Processing Societies (AFIPS) was now a presenting sponsor of *Computer Chronicles*, together with computer magazine publisher McGraw Hill, which continued its sponsorship from the previous season.
- The Kifer Tech Center did not remain empty for long. Indeed, it is still up and running today, and at last report fully leased.
- I previously discussed the Osborne 1 in a prior episode featuring Adam Osborne himself. As for the Coleco Adam, it was a disastrous attempt by Coleco Industries, Inc., to expand its ColecoVision video game console into a full-fledged computer. The Adam notably came bundled with a daisy-wheel printer, which was actually required to power the computer. The 1984 crash of the video game console market, coupled with the 1985 slowdown in home computer sales, dealt a mortal wound to Coleco. The company, which started out in leather supplies before moving into toys and then electronics, managed to stumble along a few more years behind the success of its line of Cabbage Patch Kids dolls before finally succumbing to bankruptcy in 1988. Most of Coleco's assets were sold to rival toy company Hasbro in June 1989.

- It’s worth noting that all three of the main U.S. companies brought down in the video game crash–the original Atari, Coleco, and Mattel–all tried to simultaneously enter the low-cost home computer market. Only Atari’s 8-bit line enjoyed any success. And the looming introduction of the Nintendo Entertainment System (NES) in October 1985 would only further exacerbate the home computer industry’s struggles.
- David Crockett’s successor as president of DataQuest was Manny Fernandez, the former president of Gavilan Computer Corporation, which was featured in a prior *Chronicles* episode on portable computers. Fernandez, in turn, left DataQuest in 1991 to become president and chief operating officer of Gartner Group, Inc. Fernandez later served as Gartner’s chairman and in that role helped Gartner acquire DataQuest in a 1995 deal. Gartner remains in business today.
- As important as the new DOS deal was for Microsoft in the long run, it’s interesting to note that in 1985, sales of MS-DOS only accounted for about 20 percent of Microsoft’s revenues–at least that’s what Bill Gates told the *New York Times*.
- For some reason, there was an Apple II sitting on the desk during the second round table, even though it was never turned on or used on-air.

Chapter 2: Trip Hawkins, John Merson, Ben Anixter, and Richard O’Brien

This next episode continued the previous discussion about the noticeable slowdown in the computer industry during the summer of 1985. This time, the focus was on software and hardware manufacturers, including three companies that not only survived the slowdown but remain major players in the industry today.

Like the previous show, Stewart Cheifet did his cold open from a street location in Silicon Valley, specifically Semiconductor Drive in Sunnyvale. He rhetorically asked about the future of the high-tech business given the ongoing slowdown in computer sales.

In the studio, Cheifet and Gary Kildall showed off two of the latest high-profile personal computer releases, the Atari 520ST and Commodore’s Amiga 1000. Cheifet noted both machines were praised for their good technology and low price. Yet industry analysts were saying that neither machine may make it in today’s marketplace. Just how difficult was it to bring out a new product? Kildall said the key issue was price. The Amiga cost $1,500, while the ST cost $800. Both machines came with a Motorola 68000 microprocessor and 512 KB of memory, so they were at least as powerful as the early IBM PCs. The question, however, was how these machines would fare in the commercial market and home market, respectively. The commercial market meant things like word processing, spreadsheets, and graphics that would help these machines compete against IBM’s stronghold. The home market presented a more difficult target. The manufacturers had to come up with software that people really wanted to use in the home. But if Commodore and Atari couldn’t make it with these computers, Kildall quipped, “We might as well hang it up.”

Could the Software Industry Survive on $50 Applications?

We go right into the first of two round tables for the episode. Trip Hawkins, the founder and president of Electronic Arts made his second appearance on the program. He was joined by John C. Merson, the vice president of marketing with Ashton-Tate, the developer of the popular database application *dBase III*. Kildall opened by asking Hawkins about a recent report suggesting that even as hardware sales had slowed, software sales were up 60 percent. Why the contradiction? Hawkins said the industry had been going through a phase of consolidation and overall 1985 was a slower-growth year than what some people had expected.

Hawkins continued that there were three major reasons for this. First, consumers were “tremendously confused” due to the conflicting promises and news they’d heard over the past few years. He compared it to the record industry back in 1948, when CBS introduced the LP format for the first time and RCA responded with the 45 format. Hawkins said this led to a four-year slump in record sales as consumers waited to see what standard would prevail. Second, there was an ongoing technology war and every year there were a few new computer models that were incompatible with existing systems. Again, he used an analogy: Would you buy a new and improved television set if it didn’t allow you to watch any of the current television shows? This created additional consumer confusion. Kildall asked if Hawkins was referring specifically to the Atari 520ST and Amiga, which were incompatible with the older home machines. Hawkins said yes, that was right. Hawkins continued with his third point, namely that there had been “real chaos” in distribution channels for computers and software.

Cheifet then asked Merson for his view: Was the software industry not in the same situation as the hardware industry? Merson replied that the software industry had to deal with many of the same factors as the hardware industry. There were too many players trying to bring too much product to market–and distributors and customers really could not absorb it all.

At the same time, he added, people tended to buy software throughout the life of a system they owned. As they became more conversant with the system they wanted to do more with it. So 1984 was a fantastic year for hardware, and he thought as those buyers matured, they'd want more and more software.

Kildall, continuing one of his themes from the prior episode, then brought up the question of "price erosion." He noted that in his own experience going through multi-channel distribution, the percentage taken at each level was fairly high. But as prices at the retail level continued to go down, software developers like him got to the point where they're saying, "Why should you even be in the business?" (Cheifet interjected that what Kildall called "price erosion" was great for consumers like himself.) Merson said that in many ways, software prices had been moving up and "defying gravity." He said there were currently software products being sold on the mass market for between $600 and $700, which would have been unheard of just a couple of years ago.

Kildall followed up, asking Merson to clarify what he meant by the "mass market." Merson replied that he meant the business software market, which covered about 4,000 stores across the United States. He said Ashton-Tate's software was selling "in large numbers" at the $600-$700 range in those outlets. For example, Ashton-Tate's *Framework* had sold over 70,000 copies last year.

Kildall turned back to Hawkins and asked if it would be harder to sell a $600-$700 software package on a machine like the Amiga, where the customer had to pay $1,500 just to buy the machine. Hawkins said it would be. (He also corrected Kildall, noting the Amiga 1000's list price was $1,295 for the basic configuration without a monitor.) He believed that most of the software sold for the Amiga would be priced under $50.

So how can you make any money at $50, Kildall retorted. Hawkins said it would have to be done on volume. He added that falling prices were in the best interests of the consumer, to the point that it allowed the manufacturers of software and the creative people making programs to continue to be attracted to that business.

Kildall asked what kind of install base would these lower-cost PCs like the Atari and Amiga need to have by the end of 1986 to be sustainable platforms. Hawkins said that much of the software that Electronic Arts sold went to new buyers. That is, many people bought a lot of their software when they bought their first machine. But since distribution was such a jumbled mess right now, it really mattered more which machines the retailers decided to carry as opposed to the installed base. So Electronic Arts didn't look at the market in terms of installed base.

Kildall continued to press his point, asking Merson that if $50 software became the norm, would we see a $49.95 version of *dBase III*? Merson said we'd see $49 versions of some business software. Indeed, companies like Borland had already brought desktop accessory software to market at under $50. So it could happen. But Merson added that customers looked at business software not just in terms of what they were getting today, but in terms of making a major investment of time and energy into learning the product. That investment far outweighed the cost of the software package itself. More to the point, customers wanted to be sure that the company that made the software would be around a long time to support it. In that sense, there was more "brand consciousness" among customers of business software.

Cheifet pivoted to a discussion about Ashton-Tate's recent acquisitions of other software companies. Did Merson see that as an industry trend? Would there be more consolidation in the software market? Merson said he thought so. This was a period of consolidation, there were too many software companies for the size of the market and its projected growth. He added that we'd probably past the point where a one-product company–even a company with one very good product–could be viable on its own. As these companies got together and shared sales, distribution, and marketing infrastructures, the surviving companies would be stronger.

Kildall added that customers would also look for more integration within software products. Merson agreed, noting that customers wanted products "to talk to each other": What good was the greatest word processor in the world if it couldn't exchange data with the greatest database in the world? Customers were now more insistent on software compatibility across a broad range of products.

Returning to yet another theme from the prior episode, Kildall asked what software product would finally make the home market grow? It probably wouldn’t be a database program, he quipped. Merson said he thought the three most important home applications were work, work at home, and homework. That is, home computer users wanted to use their computer to work on projects they took home from the office, run a business out of their home, and for children to work on their homework. When there was a significant installed base of PCs in the home, Merson said we’d probably see work-oriented software as a leading category.

Cheifet brought the segment to a close by asking Hawkins if he saw $50 software on the Amiga as applying to business software and not just games. Hawkins said he was talking about all kinds of software, including creativity, productivity, and games. He added that the market for home consumer electronics, including personal computers, were driven by men who were primarily interested in entertainment. So he believed that when consumers realized the entertainment experience was profoundly different on a personal computer, that was when that market would be willing to spend the money on PCs.

Ex-Apple Employees Bullish About New Startup Venture

Wendy Woods presented a brief segment featuring two former Apple Computer employees who had started their own software distributor. Woods opened by noting that Apple itself had been struggling during the downturn, laying off 20 percent of its staff during the summer of 1985. If the “dream” of Apple hadn’t died, it had certainly been curtailed, she observed.

Woods spoke with Dave Larson and Bill Cleary, who left Apple to run a new company called International Solutions. Cleary told Woods they were a lot more “frugal” at their new startup. Back at Apple, for instance, they had spent over $2 million in one day launching the Apple IIc.

Woods described International Solutions’ business as “marketing unique Apple software and hardware from abroad.” They also shipped American products overseas. These products exploited mouse technology to enable the Apple II to emulate a Macintosh-style user interface. Woods added that Larson and Cleary had started this business without any venture capital funding. Larson said he saw the market now experiencing a “resurgence of the entrepreneur,” with a new group of startups successfully launching products and product concepts. Cleary said he was also “bullish” about the market, adding they wouldn’t be working 16-hour days if they thought the business was over. This was just a transition period.

Semiconductors Slumped Due to Excess Inventory

The second and final round table featured Ben Anixter, the vice president of corporate marketing at chip manufacturer AMD; and Richard O’Brien, a corporate economist at Hewlett-Packard. Kildall asked Anixter if there was currently a slump in the semiconductor industry. Anixter replied that there had been a “severe” slump. Beginning in September 1984 there had been a very rapid slowdown in orders and shipments, which had now stabilized, but AMD’s sales were still down about 25 to 30 percent compared to this same time last year.

Kildall asked if competition from Japanese semiconductor manufacturers was the cause of this slump. Anixter said it was one concern but not the only one. There was also a tremendous accumulation of inventory that needed to be worked off plus a lot of “over-optimistic” forecasting, which resulted in a lot of companies in the PC and other industries buying a lot of stuff they didn’t need.

Cheifet asked O’Brien about the effect of the slowdown on Hewlett-Packard, which tended to focus on the scientific market. O’brien said the slowdown had been going on for about nine months at this point. He said that 1984 was a phenomenal year, and if you compared where H-P was today in 1985 compared to 1983, the growth over that two-year period was fairly good. But people’s expectations for 1985 assumed a continuation of 1984, which O’Brien said was more of an anomaly than where we were today.

Kildall asked O’Brien where he saw the “major” decline in the market. O’Brien said H-P broke the industry out into four areas: instruments, computers, communications, and semiconductors. The weakest area by far was semiconductors, he said. The computer area was flat in terms of growth. But the instruments and communications areas continued to show reasonable growth.

How would H-P pick up the computer part, Kidall asked. O'Brien said the market for capital goods overall was flat. So when those customers were financially healthier, then you'd see a recovery in the computer portion of the market.

Cheifet turned back to Anixter and asked about reports of excessive spending at AMD, such as a $100,000 Christmas party and the "elaborate things" that used to go on in the business. Did people used to be "too aggressive" and "too fanciful" in the industry? Anixter said he didn't think so. (He added that the Christmas party actually cost more than $100,000.) That was part of "sharing the wealth" with a very loyal employee base. He added that AMD had a "no-layoff" policy, which would make it easier for AMD to help get back up and running when there was an upturn in the market. Cheifet clarified that AMD did furlough people when business was down. Anixter said AMD used "short work weeks," so that everyone shared in the bad times as well as the good times.

Kildall observed that as an outsider looking at the chip industry, once a particular type of chip became successful, such as a memory chip, then it "goes across the ocean" and was built over in Japan at a lower cost. That forced American companies to keep innovating. So what was AMD looking for in terms of innovation? What new areas would it get into? Anixter said the whole part of the product line was important. You couldn't build a computer with just memory chips. You had to have innovative products in other areas to make memory work. He added that memory was only about 20 percent of the semiconductor business. What separated the companies that customers wanted to deal with was the ones who made the innovative products in other areas, such as networking, graphics displays, microprocessors, and peripherals.

Kildall asked if AMD had actually seen growth in demand for products like graphics and networking chips, or was that just speculation? Anixter said it wasn't speculation. It took a long time to get things going, so AMD was talking to customers about products that wouldn’t be ready for production for another year or so.

Following up, Kildall asked if demand for local area networking specifically would help offset the current decline. Anixter said that while nobody liked a decline in business, the resulting lowering of prices helped stimulate demand for new applications for semiconductor products.

Cheifet asked O’Brien if companies would be more conservative and less willing to take risks because of this decline. O’Brien said he didn’t think that would happen in the long run. People might be a little bit more conservative over the next year. Things weren’t deteriorating further, he said, but they hadn’t started to turn around yet.

To close the segment, Cheifet returned to the subject of Japan, asking if there was a serious long-term risk that the United States would “lose control” of the semiconductor industry. Anixter reiterated that innovation drove the industry, so you could compete if you could innovate. Moving manufacturing offshore certainly helped to compete in the international market. But “brainpower” and innovation would keep America and “our side” in good shape.

Would the Computer Industry Suffer the Fate as Auto Manufacturers?

Paul Schindler offered his first closing commentary of the new season. Admitting that his role was to be a “contrarian,” he said he saw things getting better for the computer industry. He said the “good times” of 1984 were an aberration but so were the “bad times” of 1985. The real long-term growth of the computer and electronics businesses was somewhere in between these extremes. He said there was nothing “fundamentally different” about this recession in that there would not be a major restructuring like with the automobile industry. Essentially, there would continue to be a multi-vendor computer industry.

Jobs’ Apple Sell-off a Likely Precursor to New Company

Stewart Cheifet presented this episode’s “Random Access,” which featured news headlines from late September 1985.

- Outgoing Apple Chairman Steve Jobs sold off $14 million in company stock and announced plans to sell off another $7 million worth. Analysts predicted Jobs would eventually sell all of his Apple stock and launch a new startup venture.
- More bad news for Apple: A market study from a Connecticut research firm–I’m guessing it was our old friend, DataQuest–said there was a dramatic drop in business plans to buy Apple computers. The survey said 53.6 percent of respondents planned to buy an IBM computer in 1985, up from 28.8 percent in 1984. Conversely, only 19.4 percent planned to buy from Apple in 1985, down from 28.6 percent in 1984. There was also a notable decline in business plans to buy from Tandy, Commodore, and Hewlett-Packard.
- IBM announced an 11-percent price cut on the single floppy-drive model of the PC XT. This would bring the price below $2,000.
- The recent IBM-Microsoft deal to continue development of PC-DOS (i.e., MS-DOS) appeared to be a major blow to AT&T’s UNIX operating system, Cheifet said. An analyst with InfoCorp said the deal “puts another nail in the coffin” of UNIX.
- On that point, Alloy Computer Products said AT&T would buy its new card allowing UNIX PC users to run PC-DOS software.
- Cheifet said the “biggest computer user of all” was the United States government. This was historically a mainframe market, but last year the federal government purchased nearly 38,000 personal computers, mostly from IBM.
- Paul Schindler reviewed *Ultimate Trivia* and its sequel *Ultimate Trivia II* (Mentor Learning Systems, $50), a trivia game that had “captured his heart.”
- The University of Illinois Urbana-Champaign planned to install 125 IBM PCs in one of its dorms, giving each room its own complete

system. This was part of a university study to see how computers affected the academic and personal lives of its students.
- The University of California at Berkeley recently completed its own study of how grade-school students felt about computers. Sixty-one percent of respondents said they did not like computers. And most said that kids who did like computers were “unpopular.”
- Cheifet said software companies had already started releasing updated versions of their programs to take advantage of the new graphics and sound capabilities of the Atari 520ST and Amiga 1000. For example, Electronic Arts released *Deluxe Pinball Construction Set*, which included sound effects for when the ball ricocheted off of bumpers. Another Electronic Arts game, *One on One: Dr. J vs. Larry Bird*, had a new version where you could hear the sounds of Dr. J’s sneakers squeaking on the gymnasium floor.

Ashton-Tate Fell Victim to Single-Product Problem

Three of the four companies represented in this episode–AMD, Hewlett-Packard, and Electronic Arts–are still in business today. The outlier is Ashton-Tate. This may be a forgotten company now, but in 1985 it was considered one of the major publishers of business computer software along with Microsoft and Lotus. So why did it fade into obscurity?

Well, as John Merson himself said in the episode, the era of a software company relying on a single product for its success was coming to a close. And despite aggressive efforts by management to diversify its portfolio, Ashton-Tate would continue to live–and ultimately die–by its signature product, *dBASE*.

The history of *dBASE* and Ashton-Tate is somewhat interesting, starting with how both were named. At the time of this episode, Ashton-Tate was riding high off the success of its $700 *dBASE III* package. As you might expect, *dBASE III* was the successor to *dBASE II*, which was released in 1981. But *dBASE II* was not the successor to *dBASE I*, which never existed, at least under that name.

Let’s back up a bit. In 1980, George Tate and Hal Lashlee formed Software Plus Inc (SPI). This company did not originally develop or publish software. Rather, it ran a mail-order software distributorship out of a two-bedroom apartment.

One of SPI’s customers asked about a database program called *Vulcan*. This prompted Tate and Ashlee to meet with *Vulcan*’s creator, Wayne Ratliff. At the time, Ratliff worked at NASA’s Jet Propulsion Laboratory in Pasadena, California. He developed *Vulcan* in his spare time to assist him in plotting strategy for a football betting pool. He’d tried selling *Vulcan*–named for the *Star Trek* character–through magazine ads but found little success.

At that point, Tate and Lashlee decided to get into the publishing business and market *Vulcan* themselves. They signed a contract with Ratliff where he granted them exclusive marketing rights in exchange for royalties on any sales. Tate and Lashlee then enlisted the services of a Los Angeles-based advertising executive, Hal Pawluck, to help them market their new product.

It was Pawluck who renamed both *Vulcan* and SPI. (The name *Vulcan* was already in use by another commercially available software program.) He decided to call the database software *dBASE II*, apparently because it would make customers think it was an improvement over the (non-existent) *dBASE I*. As for the company, Powluck said SPI should use the name “Ashton-Tate” as a publisher. You’ll note that the owners of SPI where Lashlee and Tate, but for some reason Pawluck thought that “Ashton” sounded better than “Lashlee.”

By January 1982, SPI/Ashton-Tate had 17 employees working out of that two-bedroom apartment. *dBASE II* had proved to be a major hit. The company reported $3.7 million in revenues for its 1982 fiscal year, although it still ended the year with a $313,000 operating loss. Tate, the company’s president, decided it was time to hire an outside manager. David Cole, who had been working as a vice president of marketing at another tech startup, accepted the offer to become SPI’s president after briefly serving as a consultant.

Within a year of Cole taking over, the company’s revenues increased nearly 500 percent. During 1983, Ashton-Tate acquired all of the rights to *dBASE*

II from Ratliff, who also joined the company as a full-time employee. Cole then took Ashton-Tate public in November 1983.

In an effort to diversify, Ashton-Tate launched its second major product, an integrated office suite called *Framework*, in January 1984. Similar to *dBASE II*, Ashton-Tate initially licensed *Framework* from an outside developer. The company also released *dBASE III* in June 1984. Both programs proved financially successful, although *dBASE* would remain the company's single dominant product.

There would also be another significant transition in Ashton-Tate's management during 1984. Co-founder and chairman George Tate was found dead at his desk in August 1984, having suffered a fatal heart attack at the age of 40. Less than three months later, in November 1984, David Cole unexpectedly resigned as president to join computer magazine publisher Ziff Davis. Cole's replacement at Ashton-Tate was the company's head of sales and marketing, Ed Esber, Jr., who previously held a similar role with *VisiCalc* publisher VisiCorp. Esber would lead Ashton-Tate for the remainder of its time as an independent public company.

Ironically, it was the low-cost competitor mentioned by John Merson, Borland Software Corporation, that would ultimately buy Ashton-Tate. After the follow-up to *dBASE III*–that would be *dBASE IV*, released in 1988–proved to be a complete disaster, Esber went looking for a buyer. Borland ended up paying $439 million to acquire Ashton-Tate in September 1991. Borland tried to update *dBASE* for the Windows era but ultimately abandoned the project in the face of stiff competition from *Microsoft Access*.

As for John Merson, his own tenure at Ashton-Tate proved remarkably brief. Merson had joined the company in April 1985 as vice president of marketing. He previously held the same title at The Computer Factory, a New York-based computer retail chain. But in November 1985, just a couple months after his *Chronicles* appearance, California-based Ashton-Tate announced that Merson had resigned to return to the east coast.

Merson is a veteran of the Vietnam war and has since 2015 served as a board member at Children of Vietnam, a nonprofit organization that focuses on reducing child poverty in Vietnam. He also works in real estate development, renovating residential properties in New England.

EA Thrived After Moving Past Hawkins' Console Reluctance

Trip Hawkins strongly disagreed with John Merson's view that working from home would drive computer sales in that market. At a December 1985 industry event, Hawkins said, "You're kidding yourself if you think Joe Six-Pack..is interested in even the slightest way of doing more work when they get home." Not surprisingly, Hawkins saw people buying computers primarily to play games.

To that end, Hawkins bet heavily on the Amiga 1000. EA spent about $600,000 developing launch titles for the new computer, according to news reports from the time. But as Hawkins himself said when correcting Gary Kildall, a base model Amiga 1000 without a separate monitor retailed for around $1,300 in September 1985. About a month after this episode aired, Nintendo of America began selling the Nintendo Entertainment System (NES)–the redesigned Nintendo Family Computer from Japan–for around $180. Commodore sold about 4 million units of the Amiga 1000 and its successors worldwide between 1985 and 1994, according to *Popular Mechanics*. In contrast, Nintendo sold over 33 million NES consoles in North America alone.

Yet Hawkins was, to put it charitably, slow to embrace the revived video game console market. As game historian Jimmy Maher explained in a 2018 post for his blog *The Digital Antiquarian*, Hawkins faced a boardroom revolt–which nearly turned into a "coup"–over the issue. Hawkins was still unwilling to deal with Nintendo due to its restrictive licensing terms, but EA would embrace and thrive on a rival platform, the Sega Genesis, which was in many respects was a souped-up version of the Amiga 1000. Both machines were built around the same Motorola 68000 microprocessor that also powered the Macintosh. But the Genesis was more user-friendly and less expensive than a full-fledged personal computer.

This time, EA’s bet on a new platform paid off. Maher noted that about 25 percent of EA’s sales in 1990 were for Sega’s machine. And in 1991, the year the Genesis “really started to take off” in North America, EA had four of the ten best-selling games on the platform. Among the successful Genesis titles was *John Madden Football*, a property that would come to define EA as the premiere publisher of sports games to the present day. (EA would later become a publisher for Nintendo’s consoles as well, although this largely happened after Hawkins stepped aside as CEO in 1991.)

Notes from the Random Access File

- This episode is available at the Internet Archive and has an original broadcast date of September 10, 1985.
- Ben Anixter (1937 - 2017) began his career at one of the original Silicon Valley companies, Fairchild Semiconductor, in the 1960s, eventually heading up its digital products marketing. After leaving Fairchild, Anixter briefly worked in consulting before joining AMD in 1971, again overseeing marketing of digital products. He went on to spend 30 years at AMD, ultimately retiring as its vice president for external affairs. Anixter passed away on July 30, 2017, at the age of 79.
- I could not confirm the current status of Richard O’Brien, although I continued to find references to his work as a corporate economist for Hewlett-Packard well into the early 2000s.
- Former Ashton-Tate CEO Ed Esber, Jr., has a personal website that includes a wealth of useful documents about the country’s history. In particular, I relied primarily on a Harvard Business School case study by Shirley M. Spence that I found on the site in preparing my description of the company’s early history.
- The company featured in Wendy Woods’ report, International Solutions, appeared to have been a short-lived venture that imported mouse-based Apple II software from France. Dave Larson and Bill Cleary previously worked in the marketing department at Apple. Larson went on to serve as director of marketing for Silicon Graphics in the early 1990s and retired in 2020 after bouncing between a number of different companies in the tech industry. Cleary founded

Cleary & Partners, a Silicon Valley marketing group, in 2007 and continues to serve as its senior partner.

- The Alloy UNIX PC expansion card was known as the DOS-73 and initially retailed for about $1,000. For reference, the UNIX PC itself initially cost about $5,000 when it came out in early 1985.
- I could not find anything regarding *Ultimate Trivia* but the company behind it, Mentor Learning Systems, was started by a former senior Apple executive, Kenneth R. Zerbe.
- I'm guessing that IBM study at the University of Illinois Urbana-Champaign (UIUC) went pretty well. Big Blue continues to have a relationship with the school. In May 2021, IBM and UIUC announced plans to create a new IBM-Illinois Discovery Accelerator Institute, a "large-scale collaboration designed to increase access to technology education and skill development."
- Steve Jobs officially left Apple on September 16, 1985, about a week after this episode aired. *InfoWorld* columnist John C. Dvorak wrote what turned out to be a premature professional obituary for the narcissistic bully and Apple co-founder: "Maybe when the smoke clears, we will have heard the last from Steve Jobs as guru, seer, visionary, and hapless victim, too. He'll just be that rich guy in the big house in Woodside. He'll go the way of the pet rock, electric carving knives, silly putty, Tiny Tim, and the three-tone paint job. Let's hope so."

Chapter 3: Thelma Estrin, Judith Estrin, Elizabeth Stott, Kay Gilliland, Jan Lewis, and Adele Goldberg

There's a telling comment from the previous *Computer Chronicles* episode that helps set the stage for this next program. When discussing the state of the computer software industry in late 1985, Electronic Arts founder and CEO Trip Hawkins said the market was driven by men who were primarily interested in entertainment. He explicitly said "men."

The notion that computer games–and by extension, computers in general–were just for "men" reflects the larger problem of sexism that continues to plague the tech industry even today. Keep in mind, the problem was even worse in 1985 when access to computers was still a luxury for most people. This only exacerbated the difficulties for women looking to enter the male-dominated culture of computer engineering. In June 1985, Stanford University released a study that found only about one-third of computer programmers and analysts were women–and the women who held those jobs earned "far less" than their male counterparts.

This next *Chronicles* episode largely focused on the positive, however, showcasing a number of women who were successful in various facets of the computer industry and looking at efforts to expand computer access for younger girls through education and gaming.

{{< youtube id="vMMAlmF2dv0" title="Computer Chronicles Episode 303 - Women in Computing" >}}

Computers Failed to Prove an "Equalizer" Among the Sexes

Stewart Cheifet opened the program standing next to a group of children using computers at San Francisco's Exploratorium. He noted there were just as many girls as boys visiting the exhibit, suggesting that the stereotype that computers were mainly for boys and men was incorrect.

Back in the studio, Cheifet and Gary Kildall looked at *Cave Girl Clair*, an adventure game developed by Rhiannon Software for the Apple II, which featured a playable female main character. Cheifet noted that most adventure games–indeed, most computer games–were aimed at men. Many people had thought computers and high-tech would be an equalizer among the sexes. Yet Cheifet said most computer engineers, programmers, and scientists were men. What explained this continuing gender gap? Kildall said the computer industry was based in general engineering, which was a male-dominated field. That said, the industry also thrived on talent and innovation rather than artificial biases and barriers. Kildall said he didn't quite know the reason for the gender gap. But he added that in his personal experience, his son was a "computer nut" while his daughter loved horses, and he couldn't say what he did to influence those preferences.

Computing's Gender Gap Grew as Students Aged

Wendy Woods presented her first remote piece for this episode, recorded at an unidentified elementary school. She said that computers in the classroom were no longer scarce. Computers were now commonly introduced to both boys and girls as early as the first grade. But while the sexes were about equally divided when it came to computer usage in elementary school, the ratio changed in later years.

Woods said that a recent study indicated that first-grade girls were just as likely to use computers as boys. But by the sixth grade, the boys outnumbered the girls 2-to-1. And by the time students left junior high school, boys made up 80 percent of the group learning to program computers.

Educators cited different reasons for this discrepancy, according to Woods, from "intimidation" and "parental pressure" to the dominance of male-oriented games in educational software. But while it may be a simple job to count heads in a classroom, Woods said, it was harder to keep track of the computer's influence outside of school.

Woods then shifted to profiling Cory Grimm, a 16-year-old woman who worked as a graphic artist for her mother's software company. (There is no on-screen chyron, so I'm guessing at the spelling of this woman's name.) Woods said that Grimm had been working with computers since the age of 10, using a joystick, mouse, and electronic palette to create art. Unlike many artists who were reluctant to trade the tactile sensations of a paintbrush for a light pen, Woods said, Grimm began her graphic arts career with the computer as her primary tool. She also had three computers at home, programmed in BASIC, and did her homework on a Macintosh.

With the help of teacher workshops, Woods said, female enrollment in computer classes had expanded recently. And some software vendors, hoping to find a new market, continued to develop programs specifically designed for women. But, Woods added, Grimm managed to incorporate computers into her own life without worrying about this.

UCLA Professor Recounted Journey as an Early Woman in Computer Science

This was a guest-heavy episode. The first of three round tables featured a mother-and-daughter pair, Dr. Thelma Estrin and Judith Estrin, respectively. (For the sake of clarity, I will identify each woman by their first name.) Kildall opened by asking Thelma, a professor of computer science at the University of California at Los Angeles (UCLA), how she managed to get into a traditionally male-dominated field like engineering when she did. Thelma said that during World War II, she had an opportunity to work in an engineering lab because the men had gone off to fight. After the war, Thelma said she decided to go back to school and major in engineering. She was able to ultimately earn a Ph.D in electrical engineering.

Kildall asked if that was rare for a woman back then. Thelma replied it was "very" rare. She was married to her husband Dr. Gerald Estrin–who also held a Ph.D in electrical engineering–and most people thought she was in school either to do his homework or to keep her "out of mischief." But they both went on to have successful careers. Gerald Estrin had an opportunity to work at the Institute for Advanced Study in New Jersey with Dr. John von Neumann. Thelma also worked at the Institute for a summer before going into a different field, biomedical engineering, and later shifting back to computer engineering.

Kildall asked Thelma if she'd seen the attitudes shift over the years. Thelma said yes, there'd been a tremendous shift. Early in her career, people would tell her, "You don't look like an electrical engineer." She didn't think people would tell a woman today, "You don't look like a computer scientist."

Kildall then turned to Judith, who was then an executive vice president with Bridge Communications, a local area networking company, and asked about the impact of her mother as a role model for her own career. Judith said her mother had helped encourage other women to enter the computer and engineering fields. Judith said she never questioned whether she should move into a "man's profession" after watching her mother do it. She did note, however, that she still got some pushback from men who said she "did not look like an executive VP of research and development."

Cheifet asked Judith for how things were going for women of her generation versus what her mother had to deal with when she got started. Judith said you had to separate the individual contributor and the first-level managers from upper-level management. At the engineer level things had changed dramatically for women. Judith said she entered the industry with young men who were very accepting of her as a colleague. Overall, she had experienced very few obstacles in her career. But at the higher levels of management, women tended to be at the top of companies they had founded. (Judith is actually referencing a point made later in the program by Jan Lewis, so presumably this segment was taped after that one.) So there were still obstacles for women in that respect, and that mainly came down to the attitudes of people in upper management.

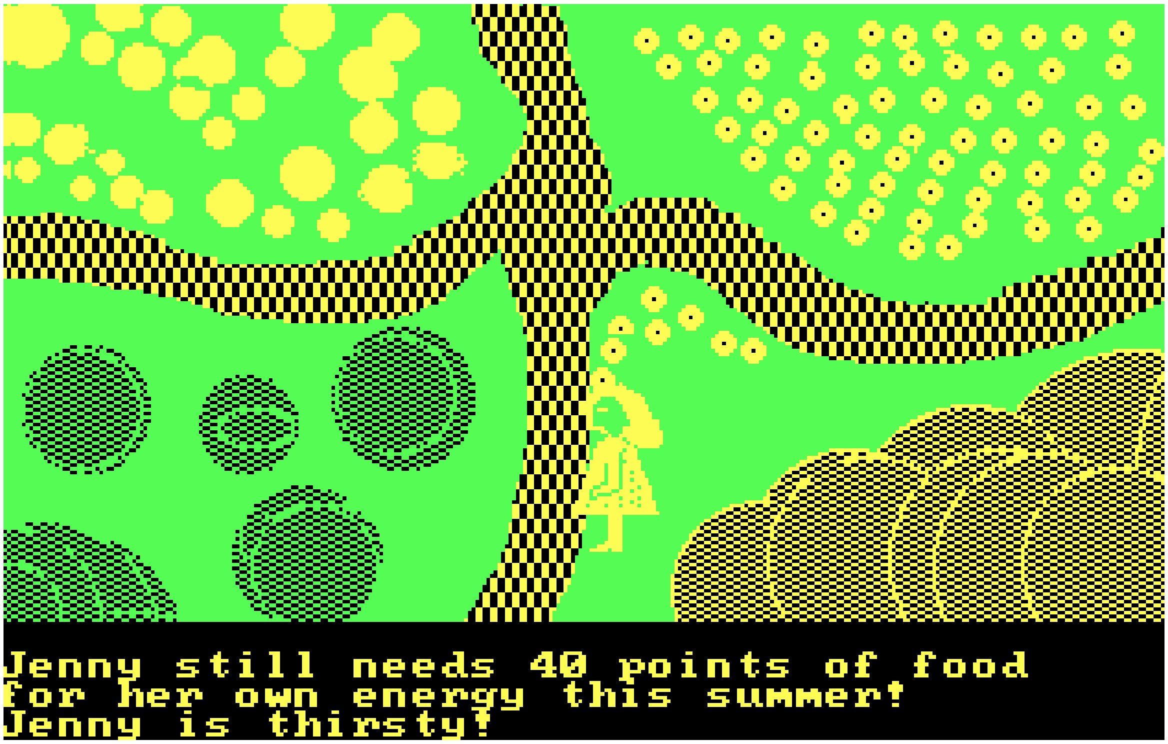
Kildall followed up, asking if that was an attitude held by people in business generally speaking, or was this specific to the computer industry. Judith said it was business in general. She thought the computer industry was more advanced in its attitudes, because it was a young industry driven by younger people who grew up in a world where women were more accepted. But sexist attitudes had not disappeared.

Cheifet asked Thelma, who taught computer science at UCLA, about the male-female ratio with respect to her own classes. Thelma said that she taught primarily at the graduate level, and UCLA also had a large group of Asian-American students. Within that community, she said you saw almost as many women as men in engineering and computer science, both at the graduate and undergraduate level. Cheifet asked, "More so than among the Americans?" Thelma said yes. Among "Americans," she said only about 10 to 15 percent of graduate students were women, with about 20 percent at the undergraduate level.

Were "Games for Girls" the Answer?

The next round table featured Elizabeth Stott and Kay Gilliand. Kildall asked Stott, the co-founder of Rhiannon Software, if she felt that the software currently available for the home computer market made girls feel that it was "not okay" to work with computers. Stott, who was also a psychologist, said that was true of most of the available software. She said that the artwork, content, gameplay, and advertising all said, “Hey, this is a boy thing!” The whole industry sent the message that this was a “male machine.” She analogized the industry’s current attitude to how back in the 1920s, a woman wouldn’t be seen driving a car.

Overall, Stott said there was an enormous psychological barrier that girls had to overcome with respect to computers. To address this, Stott said Rhiannon’s games featured “very appealing, realistic, spunky, fun, energetic” girl characters having neat adventures. (To give you an idea of what these games looked like, I’ve included a screenshot from Rhiannon’s first game, *Jenny of the Prairie*, below.)



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Jenny still needs 40 points of food
for her own energy this summer!
Jenny is thirsty!
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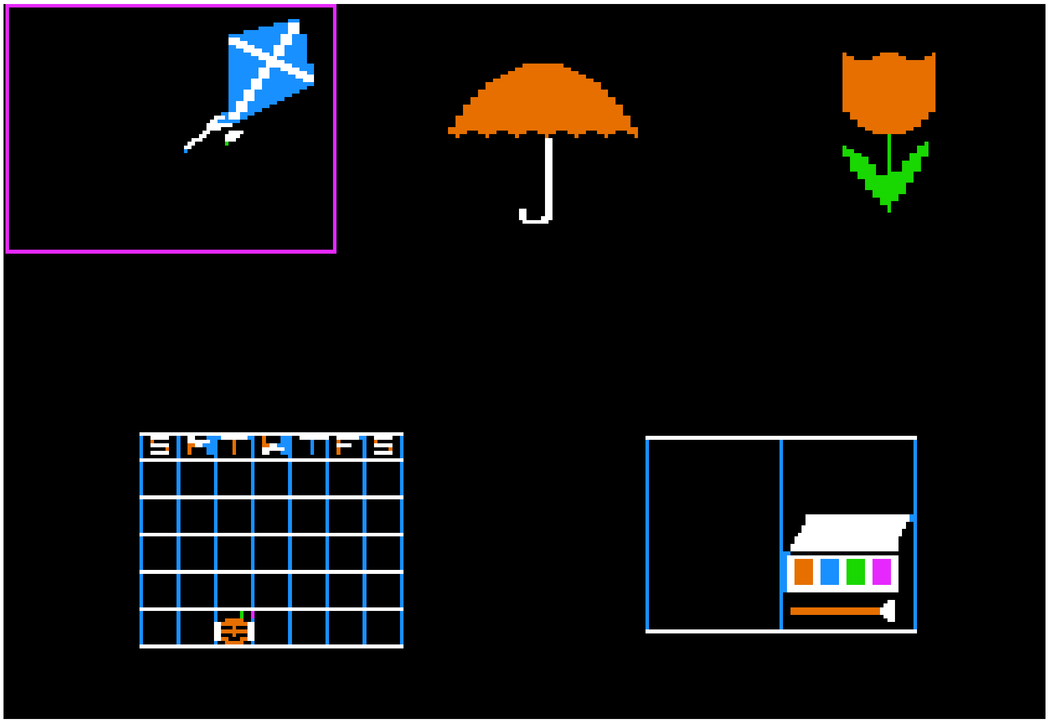
A scene from “Jenny of the Prairie.” The player character is a woman drawn in yellow. She is standing in the middle of a green field with depictions of trees, shrubs, and what appears to two intersecting rivers. The text reads, “Jenny still needs 40 points of food for her own energy this summer! Jenny is thirsty!

Kildall asked Stott to further elaborate on the differences between Rhiannon’s software and more “boy-oriented” titles. Stott said the characters were one difference. She said the style of the graphics was another difference–they were drawn at a rate that the eye could follow, which was very appealing. She said people tended to “lean into” the computer when they first saw the graphics rather than “leaning away” as they did with other software.

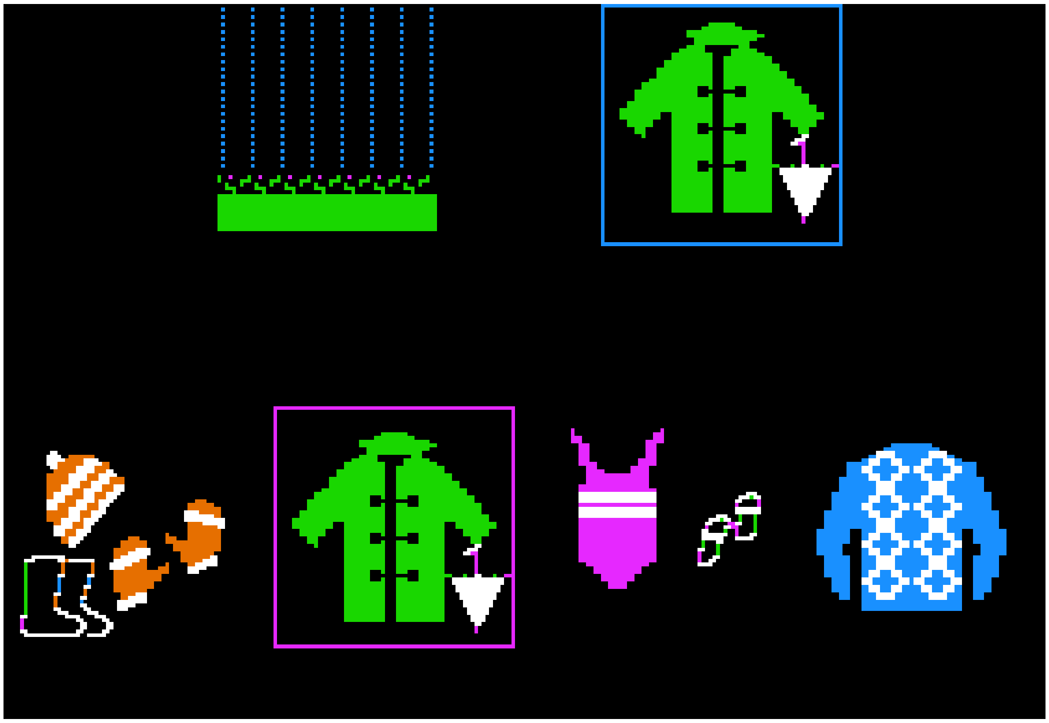
Stott then demonstrated one of Rhiannon's programs. She never actually identified the name of this game, but it was *Sarah and Her Friends*. Stott explained they'd had such a positive response with their previous series of adventure games for 7-to-12-year-old girls (including *Cave Girl Clair*), that they designed *Sarah* for 4-to-8-year-olds. Unlike the adventure games, *Sarah* did not require any reading.

As is frequently the case with software demonstrated on *Chronicles*, it's hard to actually learn much about the program from the guest's piecemeal descriptions. So I actually ran *Sarah*, which is available via emulation from the Internet Archive. From Stott's description, the entire program only uses three keys: return, escape, and the space-bar. The program opens with you selecting a group of "friends" from a bunch of avatars. Then you're taken to the main menu, which displays five options. (This is all done in pictures because as Stott noted there is no text.)



The main menu from the Rhiannon Software game, "Sarah and Her Friends." There are five options represented by pictures: a blue kite, a red umbrella, a red-and-green flower, a calendar, and a window with a box inside.

Each option leads to a mini-game involving some sort of pattern matching. For example, if you select the umbrella image you're taken to a screen where the player is asked to match an appropriate item of clothing to the weather seen outside of a "window." If you make the correct selection a short celebratory tune plays.



A matching mini-game from "Sarah and Her Friends." The top left window shows a rainstorm outside. The bottom of the screen shows four options for clothing to wear outside: A winter hat, mittens, and boots; a raincoat; a bathing suit and sandals; and a sweater. The raincoat is selected as the player's choice.

Kildall asked if the whole idea here was that by playing this game, the child would learn it was okay to work with computers. Stott said the child identified with what's going on and took it into their real life. She said Rhiannon's goal was to make computer games that matched the children. So the goal was to encourage experimentation and learning what the computer could do.

Cheifet asked Stott if she ever saw boys playing with Rhiannon's games. Stott said the extraordinary thing was that even when a game had a girl on the cover and was explicitly marketed towards girls, boys would still show interest simply because it was a new computer game. Stott said this showed the extent to which the computer was a "male-identified machine." Meanwhile, girls would say, "Oh, I didn't know they had anything for girls." And then after they played the game, those girls would go on to try other kinds of software. Stott said that was the whole point of Rhiannon Software–to crash that barrier.

Kildall then turned to Gilliland, the director of the EQUALS program at the University of California at Berkeley's Lawrence Hall of Science, and asked about the importance of introducing computers to young girls. Gilliland said it was very important to use whatever entry point that we had to make sure girls experienced computers. She noted that many of the things that Rhiannon had done were used in the home and helped tremendously. However, something also had to be done in the schools.

Gilliland added that many parents weren't even aware of the gender gap when it came to computers. She recounted a recent anecdote from her work at Lawrence Hall. A group of preschoolers–all boys–were using the Hall's computers. Gilliland asked one of the mothers if her son was in the group. He was. Gilliland asked if he liked using the computer. The mother said he did. Gilliland then asked if the mother also had a daughter. She did. Was she also interested in computers? The mother replied, "Oh, we never thought about it for her." Gilliland noted this was an intelligent woman but our whole society sent the message that computers were for boys. Kildall agreed with Gilliland that it was up to our educational system to make sure that we introduced computers in a way that did not have any gender orientation.

Cheifet said he'd seen some startling numbers from research done at Lawrence Hall. Specifically, only 7 percent of home computer users were women, 5 percent of the subscribers to *BYTE* were women, and just 2 percent of PC buyers were women. Why did Gilliland think those numbers were so low? Gilliland said our culture sent a message to girls when they were very young that computers were not for them. She noted, for example, that every picture used in the manual for the Apple Macintosh showed a man using the machine. There were no pictures of women. (She's right, I checked.) There were ultimately many reasons for low computer usage among women, she said, but it started with greater awareness among parents and teachers. Gilliland noted that her own program, EQUALS, was started in 1977 as a teacher education program for mathematics. It had now expanded into computer technology.

Cheifet asked about the type of software that EQUALS used. Gilliland showed a copy of *Gertrude's Secrets*, an educational puzzle game published by The Learning Company widely used by teachers looking for "bias-free" software that was equally appealing to boys and girls. Kildall asked how *Gertrude's Secrets* accomplished that. Gilliland pointed to the lack of violence, noting that many girls were not attracted to programs like wargames. And obviously, many teachers did want to promote violent games in their classroom. So the goal was to present things that both girls and boys enjoyed. She added that the educational component was just as important. Games that taught spatial relationships, for example, were useful as that was an area where girls had traditionally experienced difficulties.

San Francisco Project Offered Women Vocational Computer Training

Shifting the focus from children to adults, Wendy Woods presented her second remote segment, this time from the Women's Computer Literacy Project (WCLP) in San Francisco. Over some B-roll of women seated at a bank of computers, Woods said they all had one thing in common–they knew nothing about how the machines worked. They were students at the WCLP, which Woods described as an intensive two-day course for women-only where instructor Deborah Brecher taught computer basics in a "unique and controversial way."

Brecher also wrote a companion text, *The Women's Computer Literacy Handbook*, in which she claimed that women learned differently from men. While men could memorize a set of instructions and then follow them, women required an understanding of the concepts and the machines before they could fool around with them. Brecher told Woods that she'd been looking at research to see if that was true. What she found was that in game theory, boys learned rules-based games very young while girls played more process-based games (like dolls) that weren't based on rules. Brecher said that early childhood patterning led to gender differences about styles of learning.

So what women were taught at the WCLP, according to Woods, was analogies. For instance, Brecher compared a memory buffer to a bathtub and random access memory to mailboxes. Brecher said that since her classes were all-female there was a certain common background that she could assume, such as that everyone knew how to cook. And if they knew what ingredients in a recipe were, they could learn that "data" provided the ingredients for a computer's "recipe," i.e., programs.

Woods said that approximately 3,500 women–ranging in age from their teens to their 70s–had taken Brecher's course, which was the only one of its kind in the

United States. Brecher said she'd received letters from hundreds of students thanking her for teaching them "all they needed to know" about computers.

Were Women Headed in the Right Direction?

Back in the studio, Adele Goldberg and Jan Lewis joined Cheifet and Kildall for the third and final round table. Kildall asked Goldberg, the manager of the research laboratory at Xerox PARC, if she saw the emergence of a software market specifically targeting women. Goldberg said she didn't distinguish between men and women. All she saw was people and her goal was to excite all children and adults about software.

Cheifet asked Lewis, a computer industry veteran who was then serving as president of the Palo Alto Research Group (not to be confused with PARC), about the hurdles or problems she faced as a woman in computing. Lewis said while there probably were hurdles and problems, she didn't realize it until about five years ago. When she got out of college she wanted to be a programmer because that was considered a good field for women. In 1974, she moved into sales with a company called Infomatics. There, Lewis was the first female hired to work on a 100-person sales force. These days (1985), Lewis said the typical high-tech sales force was about equally divided between men and women.

But even when she worked at Infomatics, Lewis said she still wasn't thinking about discrimination. It was only when you started getting towards the top that you realized there were more opportunities for a woman if you went off and started your own company. Kildall said that seemed to be a recurring theme–that it was more difficult for women to penetrate the upper levels of management at an established company. Lewis said there were exceptions, but for the most part women reached the upper levels at their own company. That said, Lewis said she didn't have any problems as a woman dealing with clients, employees, or suppliers in running her business. She simply ignored the obstacles and strived to be the best.

Cheifet asked Goldberg if girls who didn't get early experience with computers would be at some disadvantage when they became adults. Goldberg said it was true of both girls and boys. It was becoming more imperative for everyone to have an understanding of what computers were about and how you could use them. Goldberg said that in addition to role models, younger computer users also needed to see jobs related to their interests. Goldberg said she wouldn't hire anyone who didn’t have some computing experience and done real work in the field even if they just graduated from school.

Cheifet mentioned Kildall’s daughter, who preferred horses to computers. Should a parent be concerned by this lack of interest in computers? Goldberg quipped there were days when she didn’t like computers and would rather have horses. But no, she didn’t think it should be a concern. Different people were interested in different things. Goldberg noted that she didn’t have computers in the home with her two daughters–they were learning piano and art. As they grew up their interests would change, and she did expect schools to provide some computer experience.

Kildall asked if we were heading in the right direction in getting more women involved with computers. Lewis said absolutely, particularly at the early levels. She said children had a natural inquisitiveness and as long as nothing stood in their way–i.e., as long as there was a computer for them to play with and nobody thought it was something verboten–things would trend in the right direction. Lewis also disagreed with the Lawrence Hall survey’s claim that women made up only 2 percent of PC buyers. In her own research, Lewis said that percentage was increasing dramatically among business buyers.

A “Terrible Waste of Human Resources”

Paul Schindler offered his closing commentary “as the father of two girls.” He noted that he recently wrote a cover story for *Information Week* about women in computing. And he was “mad as hell” to see how much women were still underused in the computer business. He said women should be angry because the “accident of your birth” put you at a permanent disadvantage in the computer business. It might be less of a disadvantage than in other fields but it was still a disadvantage. Schindler said men should be equally angry at this “terrible waste of human resources.”

Schindler said that he certainly hoped that nobody was arguing that women weren’t as smart as men. So there was no reason that women shouldn’t be at least half of the computer industry workforce. To be clear, he wasn’t saying “hire women because they’re women,” but rather, “Hire the best person for the job regardless of sex.”

Apple Clone-maker Re-Entered the Market

Susan Chase–formerly known as Susan Bimba–returned for the first time this season to present “Random Access” in place of Stewart Cheifet. This segment was produced sometime in September 1985.

- Franklin Computer Corporation unveiled its first Apple-compatible clone following bankruptcy and a lengthy legal battle with Apple. The new Franklin Ace 2000 would come in three models priced under $1,000–about $600 less than the Apple IIc and IIe models.
- As for Apple, Chase said it continued to improve its own products. Apple announced a IIe upgrade to expand the machine’s memory to almost twice that of the IBM PC. Apple also planned to release a higher-capacity floppy disk drive, a color monitor, and software to make the Apple II run more like the Macintosh.
- Jack Tramiel’s Atari Corporation was reportedly negotiating a deal to sell its 520ST computers through AT&T. Chase said this would give Atari a “major customer” for its new computer while providing AT&T with a low-cost entry into the PC market. Both companies, however, formally denied there were any negotiations.
- A new program called *Javelin* planned to offer stiff competition for *Lotus 1-2-3* by giving users the ability to look at their data in almost a dozen different forms. The program would sell for $700 and require an IBM PC with at least 512 KB of memory.
- Finally, Paul Schindler provided his weekly software review, this time for *Da Vinci* (Aplied Microsystems, $60), an outline program. Schindler said each outline could contain up to 5 levels with 99 topics each, although there was an overall limit of 255 headings. The finished outline could then be exported to a word processing program.

Looking Back at Remarkable Women in Computing

This was perhaps the longest episode of *Chronicles* that I’ve reviewed to date. The recording took up 29 minutes and both the opening and closing credits were removed. This was not surprising given there were three round tables and two remote features packed into the show. Before moving on to the main topics of my analysis, the history of Rhiannon Software, I would like to briefly acknowledge the backgrounds and legacy of four of the in-studio guests.

Dr. Thelma Estrin (1924 - 2014)

Dr. Thelma Estrin was born in New York City. Estrin–whose maiden name was Austern–said her mother had pushed her to become a lawyer. Austern entered the City College School of Business Administration in New York City, where she met her future husband, George Estrin.

After the United States entered World War II, Thelma Estrin took a three-month course at the Stevens Institute of Technology in New Jersey to become an engineering assistant. This led to Estrin's first job at Radio Receptor Company, an electronics manufacturer. After the war, Estrin and her husband both attended the University of Wisconsin to study engineering. Thelma Estrin would earn her bachelor's, master's, and doctoral degrees at Wisconsin.

The Estrins then returned to the east coast, where Thelma took a position at Columbia University's medical school. This was where Estrin developed her specialty in biomedical engineering. In the mid-1950s, Estrin joined her husband on a project to build Israel's first computer, the WEIZAC. After completing that project, Gerald Estrin took a position at UCLA in 1956. Thelma Estrin joined him there in 1960 after a stint teaching at a community college.

Thelma Estrin worked for UCLA's newly established Brain Research Institute, one of the first biomedical research centers to use computers. Estrin oversaw the laboratory and taught classes on biomedical computing. She was named director of the laboratory in 1970 and held that post for a decade.

In 1980, Estrin moved to UCLA's computer science department as a professor. After spending a couple of years teaching undergraduates, Estrin served as director of the engineering and computer science division for the National Science Foundation from 1982 to 1984. She returned to UCLA afterwards, and later served as an assistant dean in the engineering school. Estrin retired from UCLA in 1991. She passed away in 2014.

Judith Estrin was one of Thelma Estrin's three children. At the time of this *Chronicles* episode, she was a co-founder and executive vice president at Bridge Communications. Bridge was one of the first companies to develop commercial networking routers. 3Com acquired Bridge in 1987. Judith went on to start several more tech companies and served as chief technology officer for Cisco Systems in the late 1990s. She currently runs JLabs, LLC, a private consulting firm.

Kay Gilliland (1928 - 2013)

The other guest from this episode who has since passed away was Kay Gilliland. According to a short biography published by the California Mathematics Council, Gilliland was born in England and raised in Los Angeles. She graduated from Mills College in Oakland and worked as a math teacher in California, Hawaii, and Washington, DC.

In the late 1970s, the University of California, Berkeley, created the EQUALS project, which was designed to improve the math curriculum for girls in elementary and secondary schools. Gilliland was one of the first staff members at EQUALS. She went on to spend 20 years with the project, ultimately filling a number of director-level roles.

Towards the end of her life, Gilliland returned to Mills College, where she served as a student teacher supervisor in mathematics and science. Gilliland died in October 2013. The National Council of Supervisors of Mathematics (NCSM) has honored her since then by presenting the annual Kay Gilliland Equity Lecture Award in her memory.

Goldberg Played a Crucial Role in Creating the Modern GUI

Dr. Adele Goldberg was born in Cleveland in 1945. She attended the University of Michigan where she earned her bachelor's degree in mathematics. In a 2010 interview conducted by John Mashey of the Computer History Museum, Goldberg said her initial goal was to become a math teacher. But when she realized that she'd have to take a public speaking class to get her teaching certificate, she decided to pursue a career in computers instead.

Goldberg went on to earn her master's degree and doctorate at the University of Chicago. She told Mashey that her experience somewhat paralleled that of Thelma Estrin in that she was only able to get a fellowship because too many male students were off fighting the war (in Goldberg's case, Vietnam).

While enrolled at Chicago, Goldberg actually completed her dissertation research at Stanford. Goldberg said Chicago didn't have the funding for educational technology, which was her area of interest. So she got permission from Stanford's Patrick Suppes–a former *Chronicles* guest himself–to complete her dissertation there as a research associate.

After completing her doctorate and briefly teaching in Brazil, Goldberg joined Xerox PARC in 1973. She was part of the team that developed *Smalltalk-80*, an object-oriented programming language that helped form the basis for computer graphical user interfaces, including the original Macintosh operating system. Goldberg also worked with her *Smalltalk* colleague, Alan Kay, in outlining the “Dynabook” concept, which proposed a tablet-like educational computing device specifically for schoolchildren.

At the time of her *Chronicles* appearance, Goldberg was serving a two-year term as president of the Association for Computing Machinery. Goldberg continued to work at Xerox PARC until 1988, when she left to start her own company, ParcPlace Systems, which continued to develop Smalltalk-based applications. She served as ParcPlace’s CEO initially and later as board chairman. In 1995, ParcPlace merged into a competing firm, Digitalk.

After ParcPlace, Goldberg founded one other company, Neometron, Inc., and continues to serve as a consultant to the present day, most recently as a member of the scientific advisory board for the Heidelberg Institute for Theoretical Studies in Germany.

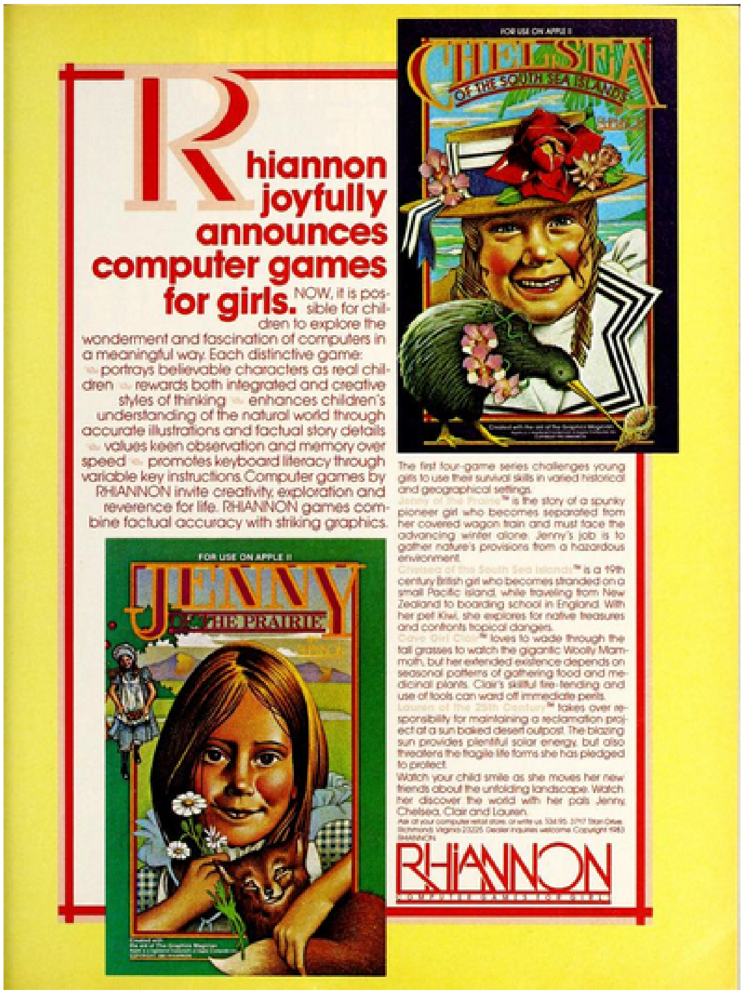
Rhiannon Partnership Struggled to Make Its Mark During Brief “Bookware” Period

Unlike most software companies we’ve seen featured so far on *Chronicles*, Rhiannon Software was never organized as a corporation. Rhiannon was a general partnership formed by Elizabeth Stott and Lucy Werth Ewell. As Stewart Cheifet mentioned, Stott’s background was in psychology. She was a licensed professional counselor practicing in Virginia. Ewell had a technical background as a computer systems analyst.

Since there’s no publicly available filings for a partnership it’s difficult to pinpoint Rhiannon’s exact date of formation, but it was likely sometime in late 1982 based on reports that it took Stott and Ewell about nine months to develop their first game. That game was *Jenny of the Prairie*. According to an October 1983 filing with the U.S. Patent and Trademark Office, Stott and Ewell first used the *Jenny* name “in commerce” on August 1, 1983. The trademark filing also lists the name of Stott and Ewell’s partnership as “Computer Games for Girls” doing business under the trade name of Rhiannon.

Jenny was almost certainly published before August 1983. In a separate filing with the U.S. Copyright Office, the date of publication was listed as May 15, 1983. More importantly, the first known advertisement for *Jenny* appeared in the classified section of *Ms.* magazine’s March 1983 issue. That ad solicited mail orders (using Stott’s home address) and listed the publisher’s name as “Computers for Girls” rather than the later “Computer Games for Girls” or Rhiannon Software.

A May 1983 publication date seems most likely, however, based on a full-page print ad that appeared in *Softalk* magazine’s issue from that same month. This ad used the name Rhiannon for the first time and advertised both *Jenny* and a second game, *Chelsea of the South Sea Islands*.



Rhiannon joyfully announces computer games for girls. NOW, it is possible for children to explore the wonderment and fascination of computers in a meaningful way. Each distinctive game: portrays believable characters as real children rewards both integrated and creative styles of thinking enhances children’s understanding of the natural world through accurate illustrations and factual story details values keen observation and memory over speed promotes keyboard literacy through variable key instructions. Computer games by RHIANNON invite creativity, exploration and reverence for life. RHIANNON games combine factual accuracy with striking graphics.

The first four-game series challenges young girls to use their survival skills in varied historical and geographical settings.

Jenny of the Prairie™ is the story of a spunky pioneer girl who becomes separated from her covered wagon train and must face the advancing winter alone. Jenny’s job is to gather nature’s provisions from a hazardous environment.

Chelsea of the South Sea Islands™ is a 19th century British girl who becomes stranded on a small Pacific island, while traveling from New Zealand to boarding school in England. With her pet Kiwi, she explores for native treasures and confronts tropical dangers.

Cave Girl Clair™ loves to wade through the tall grasses to watch the gigantic Woolly Mammoth, but her extended existence depends on seasonal patterns of gathering food and medicinal plants. Clair’s skillful fire-tending and use of tools can ward off immediate perils.

Lauren of the 25th Century™ takes over responsibility for maintaining a reclamation project at a sun baked desert outpost. The blazing sun provides plentiful solar energy, but also threatens the fragile life forms she has pledged to protect.

Watch your child smile as she moves her new friends about the unfolding landscape. Watch her discover the world with her pals Jenny, Chelsea, Clair and Lauren.

“Rhiannon joyfully announces computer games for girls.”

The first press coverage of Rhiannon appears to have been a July 12, 1983, column in the *Boston Globe* by Ronald Rosenberg, which quoted Stott promising two additional games–*Cave Girl Clair* and *Lauren of the 25th Century*–for release later in 1985. Stott told Rosenberg that she planned to market the games herself starting in August 1985 and that she had turned down an offer of venture capital funding because, “I just did not want to see a bastardized product.”

Rhiannon’s copyright filings list an August 15, 1983, publication date for *Clair*. The publication date for *Lauren* is unknown as I could not find any copyright filing. Indeed, *Lauren* is something of a mystery as it is the only Rhiannon program that has not been archived by any known online repository, such as the Internet Archive. But the game was advertised together with the other three programs in 1984 and 1985, so it presumably did come out at some point.

Although Stott seemed to resist using an outside distributor initially, she and Ewell eventually signed a publishing deal with Addison-Wesley sometime in late 1983 or early 1984. Addison-Wesley was (and still is) best known as a publisher of textbooks. During the period from roughly 1984 to 1986 there was an attempt by many traditional publishers like Addison-Wesley to enter the software market with so-called bookware, i.e., adventure games with a literary bent. Addison-Wesley had published one of the more successful bookware titles, an adaption of *The Hobbit* imported from the United Kingdom, and it also marketed the four Rhiannon adventure games for girls during 1984 and part of 1985.

By the time Stott appeared on *Chronicles* in September 1985, however, Rhiannon was back to self-publishing its software. It was in this post-Addison-Wesley period that Stott and Ewell released their final two products, *Sarah and Her Friends* and *Kristen and Her Family*. Unlike the previous four games, which all focused on a lone female protagonist surviving in some sort of outdoor camping environment, *Sarah* and *Kristen* emphasized the female character’s interactions with groups. In *Kristen,* for example, the player chose a home for her “family” and played mini-games that mimicked performing chores.

The last news articles to discuss Rhiannon Software appeared in March 1986. After that it’s unclear exactly when and how Rhiannon ceased operations. I was unable to find any information regarding the post-Rhiannon career of Lucy Ewell. As for Elizabeth Stott, she remained a practicing therapist in Virginia until 2003 and is presumably retired at this point.

Judging by the amount of press clippings Rhiannon accumulated between 1983 and 1986, its emphasis on “software for girls” certainly generated a lot of buzz. We don’t know how that translated into sales as Rhiannon never published any such figures to my knowledge. And not all of the press attention was positive. Interestingly, Stott and Ewell’s work faced significant criticism from contemporary feminist scholars and other women working in technology education.

For example, the spring 1986 issue of *Feminist Collections*, a quarterly journal published by Thelma Estrin's alma mater, the University of Wisconsin, featured a write-up by UW Professor Elizabeth Ellsworth that cited one of her colleague's views regarding "computer games for girls":

> In a recent interview, Dr. Mary Gomez, lecturer in Elementary Education at [UW] questioned the implications of Rhiannon Software for antisexist education. The girl user is put in the traditional female role of helper and nurturer, thus perpetuating stereotypical gender roles. This type of software also threatens to perpetuate sexist notions about what girls like vs. what boys like. Gomez referred to research that shows that both boys and girls enjoy many different kinds of learning–e.g., intrinsic and extrinsic; competitive and cooperative; open ended patterns, movements, and colors as well as lineal sequential goal seeking. "Computer can offer any of these. We need to offer all kids varied entry into technology as individuals," Gomez said.

Along similar lines, a January 1986 feature story in the *Pittsburgh Post-Gazette* offered comments from Nancy Kriesberg, the director at the University of California's EQUALS program and a colleague of Kay Gilliland, who said that while Stott and Ewell had their hearts in the right place, "I don't think you have to have programs for girls. If you have good, challenging software, you don't have to have sex differentiation." As Gilliand did on *Chronicles*, Kriesberg pointed to the educational games produced by The Learning Company as a good example of quality software free of gender bias.

Despite the criticism, the Rhiannon games seemed to review well. Scott Mace of *InfoWorld* offered an overall positive assessment in an April 1984 column. To his credit, Mace didn't rely solely on his own assessment–he asked the 13-year old sister of a colleague to play the games and offer her thoughts. The colleague reported back as follows:

> I thought [my sister] Sally would be somewhat turned off because these are games for girls–Sally enjoys video games that most girls don't care for.
>
> My preconceptions were wrong. Not only was she intrigued by the games, but also her patience lasted longer than did mine. In *Cave Girl Clair*, Clair, accompanied by her pet rabbit, must learn to survive on her own. "It's

> different from a lot of other games," Sally said. "You have to play it more than once."
>
> Sally did feel, though, that this game had too many controls and that it was too complicated for her to master in a half-hour sitting. She liked the second game, called *Jenny of the Prairie*, a lot more, although she couldn't understand what some of the graphics represented.

These comments hint at why Rhiannon Software did not enjoy any sustained success in the market. Adventure games were a tough sell to children regardless of sex. The adventure game was rooted in text-based programs developed for university mainframes–the genre is named for *Colossal Cave Adventure*, originally programmed for the PDP-10–and relied on quirky interfaces and often convoluted puzzle design. Later adventure games, such as Sierra Online's *King's Quest* series, which debuted in 1984, took this latter idea of "moon logic" to even greater extremes while adding graphics and a fantasy world setting. For their part, Rhiannon's games adopted a similar (although less polished) graphical approach to Sierra's while making the puzzles and settings much more realistic.

That realism may have also been to Rhiannon's detriment. In the manual for the Atari release of *Cave Girl Clair*, for instance, the player is told, "If [Clair] is lucky, she may find a carcass in the grassland. She can carry the hide and bones back to the cave." That's pretty raw for a game targeting pre-teenage girls.

It's especially odd given that the cover designs and packaging for Rhiannon's games exclusively portrayed young *white* girls from well-to-do families. Stott herself admitted in later interviews that the cover designs were too "WASPy." Beyond that, at least one game engaged in racist stereotyping. The marketing copy for *Chelsea of the South Seas* referred to the main character–a New Zealander heading to England to attend boarding school–needing to avoid "cannibals" while stranded alone on an island.

Setting that aside, I suspect Rhiannon got caught between something of a rock and a hard place. Their initial push as a self-publisher and later through Addison-Wesley was to market their adventure games directly to parents with home computers, primarily the Apple II. But as we learned from the previous two episodes, the home computer market was not growing much during this time period. And the dominant platform for home computer gaming was rapidly becoming the Commodore 64, not the Apple II.

Of course, the Apple II *was* the dominant computer platform in schools and would remain so well into the early 1990s. But Rhiannon's approach to adventure games wasn't conducive towards attracting teachers for the reasons cited above. Meanwhile, there was another Apple II-based adventure game released in 1985 that targeted children and ultimately proved highly appealing to teachers and schools–Brøderbund's *Where in the World is Carmen Sandiego?*

Carmen wasn't initially a big commercial hit but gained support through word-of-mouth among teachers who used the game to teach world geography. Unlike Rhinannon's adventure games, *Carmen* offered a simple menu-based interface and a much tighter focus on education. It also didn't hurt that the "Carmen Sandiego" character was generally portrayed as a non-white woman, even if she was the game's antagonist rather than a playable protagonist. (Carmen led a "gang" of male and female characters that the player had to pursue by interpreting geography-based clues.)

Games like *Carmen* helped launch the late 1980s "edutainment" wave in computer software, which established publishers like Brøderbund dominated. This left little room for niche publishers like Rhiannon, whose adventure games were likely already considered outdated by 1986. Rhiannon's final effort to pivot to more open-ended games like *Sarah and Her Friends* was probably a good idea, but it seemingly came too late.

Notes from the Random Access File

- This episode is available at the Internet Archive and has an original broadcast date of September 17, 1985.
- Special thanks to Kate Willaert, a video game historian who graciously provided me with her own research materials on Rhiannon Software and offered some valuable insights on the company's products.
- I do have more to say about Deborah Brecher and the Women's Computer Literacy Project, but given this post is nearly 7,500 words, I decided to move that discussion to a future special post.
- The other guest in this episode, Jan Lewis, will become a regular *Chronicles* contributor, so I'll delve more into her biography at a later time as well.
- Dr. Adele Goldberg once served on the board of trustees for the Exploratorium in San Francisco, where Stewart Cheifet did his opening standup for this episode.
- Dr. Thelma Estrin had another daughter, Dr. Deborah Estrin, who followed her mother into the field of medical technology. Dr. Deborah Estrin is

currently a professor of computer science at Cornell Tech, where she is also an associate dean. Deborah Estrin also previously worked at UCLA, just like both of her parents.

- Elizabeth Stott's touting the unique "style" of graphics in Rhiannon Software's games was a bit misleading. In fact, Rhiannon used an off-the-shelf program, *The Graphics Magician*, by Jon Niedfeldt and Mark Pelczarski, to design all of their adventure games. *Magician* used vector-based commands to draw images without the need to store them on the disk. A number of adventure games in this time period used similar systems, including Sierra's *King's Quest* series.
- The Learning Company game *Gertrude's Secrets* mentioned by Kay Gilliland was co-authored by Warren Robinett, who previously developed another landmark adventure game–*Adventure* for the Atari 2600.
- The rumored AT&T-Atari distribution deal for the 520ST was just that, a rumor. Atari Corporation President Sam Tramiel, one of Jack Tramiel's sons, told computer columnist James Calloway in November 1985 that the two companies were talking about a deal–but to license UNIX for Atari's planned successors to the 520ST. Atari did release a machine in 1990,the TT030, that was capable of running UNIX and was one of the earliest machines adapted to run Linux.
- The makers of the *Da Vinci* outline software were apparently so confidant in their work that, according to a review in *InfoWorld*, they offered to send any dissatisfied customers a free copy of a competing program, *Max Think*.
- Rhiannon Software was named after a figure from Welsh mythology. Also known as the "Goddess of Birds and Horses," Rhiannon was falsely accused of murdering her son and forced to carry visitors to her husband's castle on her back like a horse.

Chapter 4: The Okimate 20, IBM Quietwriter, HP LaserJet Plus, and Adobe Postscript

The Macintosh never lived up to the hype of the infamous “1984” Super Bowl ad. But by the end of 1985, the Mac started to find its niche as a desktop publishing machine. It was actually the launch of Apple’s LaserWriter printer in March 1985 that helped spark this new age of computer-based publishing. Indeed, the $2,500 Macintosh was effectively an accessory for the $7,000 laser printer, not so much the other way around.

But the LaserWriter was just one piece of the desktop publishing puzzle. There was also *Aldus PageMaker*, the typesetting and layout software package launched in July 1985 for the Macintosh, which became the platform’s first “killer app.” And then there was Adobe’s *PostScript*, the programming language that made it possible for *PageMaker* and other software to communicate with the LaserWriter.

The creator of *PostScript* was one of the in-studio guests in this next *Computer Chronicles* episode from September 1985. The overall subject was printers and business graphics, with an emphasis on thermal-transfer and laser printing technology. This was the second *Chronicles* show dedicated to printers. Stewart Cheifet actually dispensed with the normal cold open to recap that previous printer episode from October 1983.

In the studio introduction, Cheifet showed Gary Kildall a paperback book that was made entirely on a Macintosh using a laser printer. Cheifet noted the difference in quality from the printers featured on the show a couple of years ago. Cheifet pointed out that back then, Kildall said progress in printer technology would be slow because printers depended on a lot of mechanics rather than electronics. Was he wrong about that? Kildall quipped that we’d never get over the fact that a printer was where the electronic signal became ink-on-paper, and that process hadn’t been helped that much by microchip technology. And while laser printers now made high-resolution text publishing more affordable, the challenge now was to see if it could do the same for high-resolution graphics.

{{< youtube id="wbkWVx4lv-8" title="Computer Chronicles Episode 304 - Printers and Business Graphics" >}}

What You See on the Screen Is What Comes Out of the Printer

Wendy Woods presented her first remote segment, narrating some B-roll footage taken at an unidentified company that used a computer and high-end printer to do its publishing in-house. Woods said the effectiveness of a document depended on the visual impact it made on the reader. As a result, most companies with in-house publishing departments depended heavily on their graphic artists to produce attractive publications. Woods noted there were many drawbacks to this dependence, such as the obvious "typewriter" look of the text and the tedious process of manually pasting up diagrams and drawings.

But these "rough edges" were getting a lot smoother thanks to new software and a great leap in printer technology. For example, Woods said, the flexibility of a word processor had been extended to integrate graphics with print-like text. Using a high-resolution screen, an operator could choose from a large number of font sizes and styles and mix them with extensive graphics to create an integrated package. What the operator saw on the screen matched what came out of the printer, including data-driven business charts, diagrams, and even external artwork and photos.

But while office computers may have reduced the need for some paperwork, the demand for computer-generated hardcopy continued to grow. Woods said that in 1983, about 2.5 billion pages of computer printouts were produced worldwide. By 1989, that figure was expected to grow to over 4 billion pages. As the gap between in-house and professional quality narrowed, Woods concluded, the quality of office documents would make it more difficult to tell the difference between typewriter and typesetter.

Okimate, Quietwriter Could Run Simultaneously Without Drowning Out Studio Conversation

Our first round table featured Bob Lamvik and John Dickinson. Kildall reminisced to Dickinson, a writer and editor at *PC Magazine*, that when it came to printers back in 1975, he actually bought a teletype to print out program listings and a separate Diablo daisy-wheel printer to produce letter-quality text. That setup cost about $5,000. Now, in 1985, Dickinson had just produced a feature for *PC Magazine* where they reviewed over 200 printers. So what were the different categories of printers now available? Dickinson said you could divide printers into categories by price, with models ranging from as low as $100 to as high as $8,000 to $12,000. You could also classify printers based on print quality, although Dickinson noted that even today's Diablo and dot matrix printers were perfectly capable of producing very acceptable correspondence quality. It was actually a wide-open field in his view.

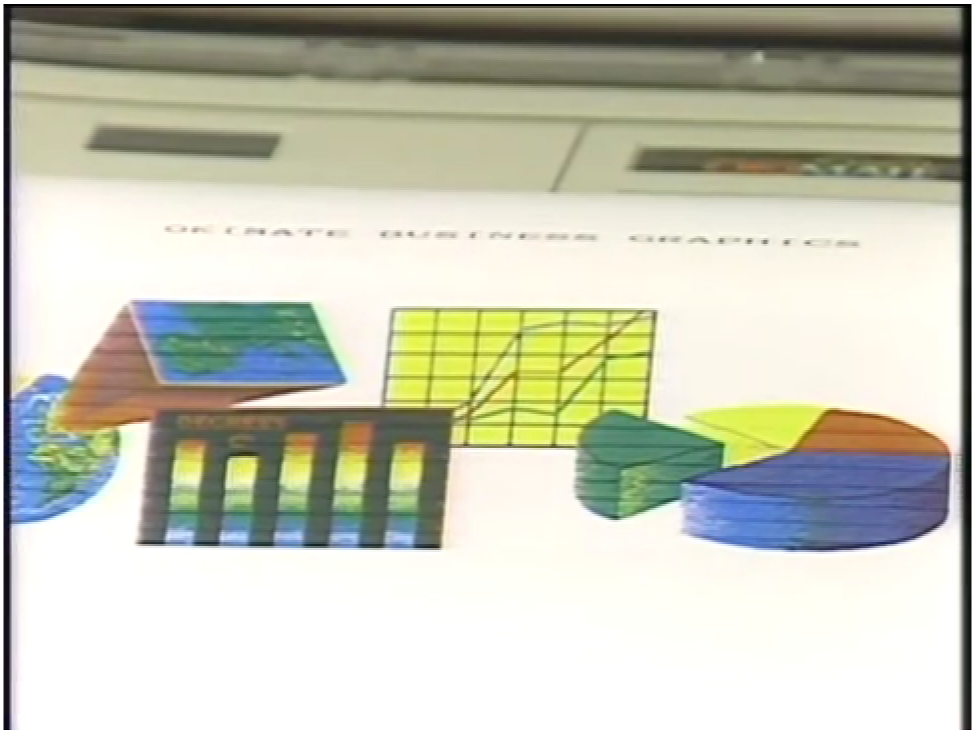
Cheifte turned to Lamvik, a regional sales manager with printer manufacturer Okidata, and asked for a demonstration of the company's Okimate 20 printer. Cheifet noted the Okimate represented the "extreme" from the teletype that Kildall described. Lamvik conducted a demo of the Okimate, which he described as one of the lower-end printers based on price, retailing for under $300. It used thermal-transfer technology, which was not the same thing as a thermal printer. A thermal-transfer printer, he explained, involved moving a waxed ribbon ink onto plain paper. It also produced "vibrant" colors.

Cheifet also pointed to a second printer in the studio, the IBM Quietwriter. Cheifet asked Kildall to "fire up" the Quietwriter so they could see just how little noise it made, especially while running at the same time as the Okimate. (This was to provide contrast with the 1983 printer show, which I noted in my blog post featured some very loud Diablo printer demos.) Dickinson explained the Quietwriter was similar to the Okimate in that it was a thermal-transfer printer. The Quietwriter was a higher-grade machine that cost more–about $1,400–but it had higher resolution and its standard mode of operation was to produce "correspondence-quality" text. The newest version of the Quietwriter could produce graphics, but not in color like the Okimate 20. Dickinson added that it would have been “impossible” two years earlier to sit and talk normally while two printers were running simultaneously, but the group had little trouble conversing as both the Quietwriter and Okimate 20 were still printing.

Cheifet asked if the older daisy-wheel printer was now a “dinosaur” given the competition from these newer thermal-transfer printers. Dickinson quipped that dinosaurs wouldn’t go away that easily. He noted that there were still new daisy wheel printers coming out, some of which were capable of producing 50 to 60 characters per second, which was unheard of a couple years ago. The major hurdle faced by daisy wheel printers was lack of support from newer software, such as Digital Research’s GEM and Microsoft’s Windows, which required graphics-based printers to operate correctly. If those software packages took off, then older daisy wheel printers would be in trouble.

Kildall followed up, asking if there also wasn’t a threat to older printers from newer machines based purely on speed. Dickinson said he thought there would continue to be a range of speeds available as well as compatibility standards. So there would probably be just as much confusion among buyers in the future as there was today.

Kildall asked Lamvik how important color was as a feature in a printer. Was it a novelty? Or was it something that would be important in the future of printers? Lamvik said color was an up-and-coming technology. Prior to 1985, the biggest downfall in printing color graphics was software compatibility. One way that Okidata addressed that with the Okimate 20 was that they bundled a generic printer with a “personality module” that slid into the side of the printer. This module included two diskettes–a learn-to-print tutorial and a color screen printing utility, which Lamvik used to produce a demo printout (seen below). This utility allowed the user to rotate and size the object and change its colors.



A printed page from an Okimate 20 color printer. The page features a number of sample charts in color, including a bar chart, a line graph, and a pie chart.

Dickinson was more cautious about the future of color printing for now. He thought the Okimate 20 and similar inexpensive color printers were a good buy as a “second printer.” But it remained to be seen whether the software and support for color printing would continue to grow the market in that area.

HP Offered 300-dpi Quality for 5 to 7 Cents Per Page

The next segment opened with a stand-up demonstration of Hewlett-Packard’s LaserJet Plus printer. Chuck Ulfers, a marketing manager for HP’s printer division, conducted the demo. Cheifet noted that unlike the two printers featured in the previous segment, the LaserJet was (obviously) a laser printer. How did that technology differ? What went on inside a laser printer? Ulfers said the technology was similar to what was used in photocopiers. The image is transferred to a photoconductive drum using a laser. The drum is then rotated past a station that applies a powdered plastic or “toner,” which is then transferred and fused into the paper.

Kildall asked for a comparison of the speed and price-performance of the LaserJet relative to the thermal-transfer printers previously demonstrated. Ulfers said the LaserJet printed 8 pages per minute and sold for $2,995. It printed in either direction on the page and could place a number of different fonts on a single page. Kildall asked for the per-page cost. Ulfers said it was between 5 and 7 cents.

As the LaserJet printed out some sample pages, Kildall noted they looked much like traditional typeset pages. That would seem to be one of the big advantages of a laser printer over some of the other options. Ulfers agreed, noting that laser printers today typically had a very high resolution, about 300 dots per inch (dpi). That gave the LaserJet the ability to do very nice artwork and graphics. He noted the sample printout (see below) had graphics in addition to text in multiple fonts. Ulfers also showed off an IRS Form 1040 and a sample black-and-white graphic reproduced on the LaserJet as additional examples of its abilities.

ahh, Natural!

> A sample printed page from the HP LaserJet Plus. The top of the page has the text, “ahh Natural!” Most of the page is covered with black-and-white images of various cut vegetables sitting on a cutting board, including an avocado, lettuce, tomatoes, and mushrooms.

Kildall asked about the role of the “Canon engine” (more precisely, the Canon LPB-CX) in connection with the LaserJet. What did Canon have to do with any of this? Ulfers said that a number of laser printers, including HP’s LaserJet, were based on the Canon engine, which as he previously explained was originally developed for photocopiers. Kildall followed up, asking what other laser printers also used the Canon engine. Ulfers said the Apple LaserWriter and the QMS laser printer were two examples, and there were several others.

Cheifet asked why someone would spend $3,000 on a laser printer. What were the main features that a user would look for in buying such a machine? Ulfers said that HP’s studies showed that the primary reasons people bought a laser printer was that it was quiet, had very high quality output, and was very fast. He added that over time the market would evolve to a more sophisticated appreciation for the graphics capabilities of the laser printers.

Kildall asked if we were likely to see a smaller, lower-cost version of the LaserJet Plus for home computers. Ulfers said you would see the technology continue to evolve downward in terms of cost and size. He noted the LaserJet Plus was the second generation of that particular product line, which was less than 18 months old.

San Francisco’s First Digital Graphics Design House

Wendy Woods returned for a second remote segment, this time from Tech Art, a graphics design house in San Francisco. Woods said Tech Art was the first such company in the United States to exploit the Macintosh, the Apple Laserwriter, and *Aldus Pagemaker* to do all of its in-house typesetting by computer.

Woods explained that the computer did all the drudgery of paste-up and layout, leaving humans to the more creative tasks. Tech Art president Diane Burns told Woods that you still needed to have an eye for design. The computer and software were simply tools that were faster and took out the more mundane aspects of traditional publishing techniques. She noted that some of her artists felt their illustration capabilities had actually improved by using the Macintosh.

Woods said there were two other advantages to computerized typesetting. First, new employees could pick up graphics skills quickly, meaning less training time for the shops. Second, the basic equipment turned out camera-ready galleys and originals that cost a fraction of conventional typesetting gear. Woods said Tech Art's success inspired many people to call Burns every week asking for help in starting their own computerized typesetting businesses. Woods said customers ultimately benefited, as they got their work a lot faster and cheaper. For example, Tech Art priced the cost of an 8.5-by-11-inch flier and found that conventional shops charged 5-to-6 times more than it did.

Could Adobe Make *PostScript* the Standard for Laser Printing?

Back in the studio, Dr. John Warnock joined Cheifet, Kildall, and John Dickinson. Warnock was the co-founder and president of Adobe Systems, Inc., the developer of *PostScript*. Kildall noted that computer text relied upon the ASCII standard. In a similar vein, *PostScript* provided a standard for high-resolution graphics produced by laser printers. Warnock said *PostScript* was the "magic" that sat inside of the laser printer. It took the description of the printed page–text, typesetting, description of shapes and photographs–and translated it into commands for the printer.

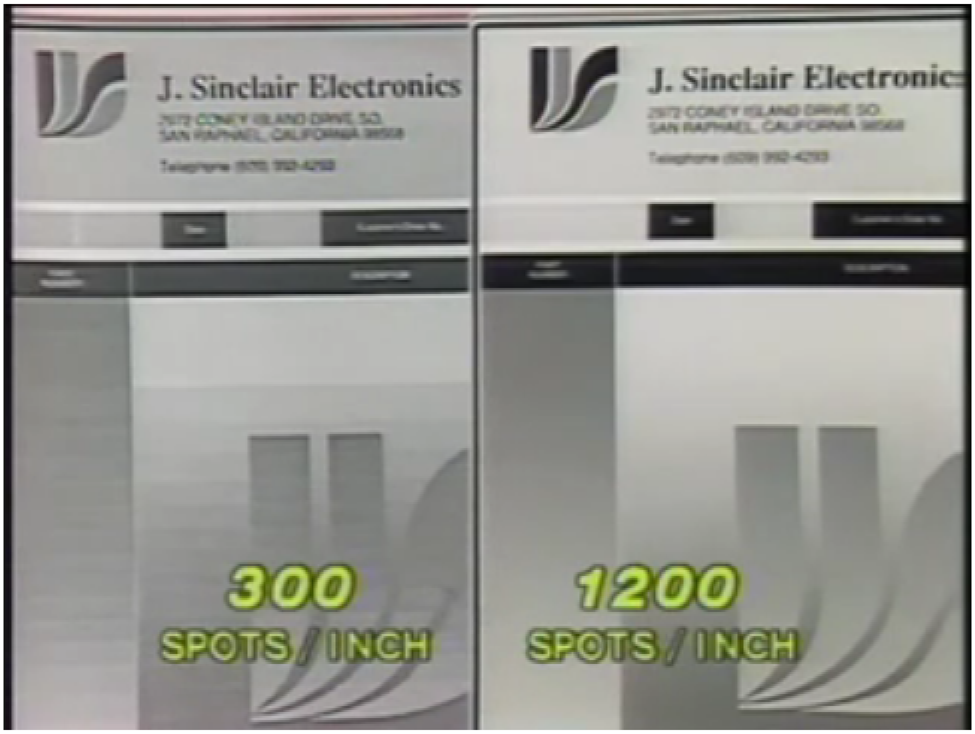
Kildall clarified that *PostScript* wasn't a programming language that the end-user would operate. Rather, it sat at the program interface level. Warnock said that was right, *PostScript* was designed to be transmitted by applications, such as a graphics program, over the communications wire to the printer. That description was then interpreted by the printer.

Kildall said as long as a wide variety of printer manufacturers agreed to that standard, everything would be great. Warnock said Adobe offered *PostScript* to a number of printer companies and had found increasing acceptance. *PostScript* created a device-independent description that allowed for many different-resolution devices to be driven from the same description.

Kildall asked Dickinson if he thought this was a good approach. Dickinson said it was. He noted that when it came to print enhancements–things such as bold and underlined text–there hadn't been standards in the past. It was only recently that we'd seen a convergence on three or four major standards. Adobe had a chance to standardize laser printers before it got out of control. Even now, Dickinson said other vendors like Hewlett-Packard adopted standards that were completely different from *PostScript*.

Kildall said *PostScript* had the potential to encroach upon the entire traditional typesetting industry. Warnock agreed, noting *PostScript* was designed with the graphic arts industry in mind. In other words, *PostScript* did halftones, full typefaces, kerning, et al., all things required by traditional typesetting and layout.

Cheifet then asked Warnock to show an example comparing the output using *PostScript* to what came out of a traditional typesetter. Warnock showed a business form printed on the Apple LaserWriter (at 300 dots per inch) versus that same form produced by a professional printer (at 1,200 dots per inch). He said the LaserWriter version was perfectly acceptable for office use, while the latter would be more appropriate for high-volume print runs. But both forms were based on the exact same *PostScript* file.



A side-by-side comparison of a corporate form. The form on the left side was produced at 300dpi by an Apple LaserWriter, while the form on the right was produced at 1200dpi using a traditional typesetting method.

Cheifet asked if we'd ever see a 1,200-dpi resolution coming out of a laser printer. Dickinson said he hoped so. He noted that the LaserWriter's 300-dpi resolution represented what you could get for $3,000-$6,000 today. In 2 or 3 years, you could hopefully get 1,200-dpi resolution at that same price level.

Kildall asked if there was any real competition for the *PostScript* standard. Warnock said Xerox was promoting its own standard description language called *Interpress*. Warnock actually worked on the Xerox team that designed *Interpress* before leaving to start Adobe.

Cheifet closed by asking Dickinson about other technologies beyond the laser printer. Dickinson said LED array printers had been announced and could be out by the first quarter of 1986. Cheifet asked what advantage an array printer had over a laser printer. Dickinson said the array printer had fewer moving parts, which meant it would likely cost less than a laser printer.

Lotus Launched New Product, Recalled Another

Susan Chase returned to present this week’s “Random Access,” which was recorded in late September 1985.

- Sperry Corporation introduced a PC-AT clone, the Sperry PC/IT, which was faster and offered more memory than the IBM model. Sperry said the PC/IT also ran UNIX (specifically Xenix) and could support up to eight users at a time. Chase said Sperry was among a half-dozen companies now marketing AT clones. There were also rumors that Hewlett-Packard would shortly join the fray with their own lookalike.
- AT&T unveiled a system that would allow people to gain computerized stock information by speaking into their telephones.
- Lotus Development also planned to enter the stock business with a new hardware-software package called Signal, which could “signal” a user about price movements in a particular stock by making an audible beep.
- Lotus also issued a recall for all retail copies of version 1.1 of its *Symphony* office suite after users complained that their data disappeared when using the spreadsheet component. Lotus said it would send current *Symphony* users a corrected floppy disk version next month.
- Paul Schindler reviewed *PC Color* (Affirmware, $35 or $44 without copy protection), a program that produced kaleidoscope images on a personal computer (basically an early screensaver). Schindler said he found the images “soothing and interesting.”
- Neither Commodore nor Atari planned to participate in the upcoming Winter Consumer Electronics Show in January 1986.
- The American Paper Institute reported that the market for office paper grew over 5 percent annually from 1972 to 1984 when the move to “office automation” was in full swing. Chase said that many companies attributed the increased paper use to computers, which made it easier to produce more original documents.

- Jeff Raskin of Information Appliance announced a new plug-in board for the Apple II called SwyftCard, which promised to simplify the computer's operations and improve overall performance.

Okimate Printer Raised "Razor and Razor Blades" Concerns

John Dickinson was definitely high on the Okimate 20. In that special *PC Magazine* printer issue, Dickinson included the Okidata printer at the top of his "Editor's Choice" list. Echoing his on-air comments, Dickinson wrote that the printer's $268 price made it a "good choice for a second printer for color or an entry-level printer for home use." Dickinson was also impressed by the size–or lack thereof–of the Okimate 20, joking, "When I first saw this little gem, I thought Okidata must be joking about the abilities of this toy-size printer," which he compared to a telephone answering machine.

Some other reviewers, however, saw the Okimate's low price as a trap. Erik Sandberg-Diment, writing for the New York Times News Service, said that while the Okimate was a "real bargain," its color ink ribbons cost $6.69 each (the black ink ribbons cost $5.95). He saw this as a case of promoting a "razor and razor blades" model, where the real money was made on forcing customers to keep buying more ink ribbons–a criticism of the printer industry that continues to this day.

Similarly, Gannett News Service columnists Shelly Heller and Judith Axler Turner noted that it took a long time–in some cases three to four weeks–to get replacement cartridges and special paper from Okidata, which did not sell these items through retailers. They also commented that while the Okimate 20's manual said a single ribbon would print about 75 sheets, in their testing they only managed to get 53 sheets. "Given the cost for the ribbon and paper, every printed sheet costs 15 cents," they said, concluding the Okimate 20 was not a cost-effective option for the home user.

Two Years of Work on *PostScript* Paid Off Big for Startup Adobe

As I alluded to in my introduction, the real star of this episode was not any of the individual printers, but Adobe's *PostScript* language. Benj Edwards, writing for *MacWorld* in 2010, explained how the combination of *PostScript* and the Apple Laserwriter helped make the Macintosh the dominant platform for late 1980s graphics design and publishing:

> The genius of *PostScript*, in Apple's case, was in the way it could compress information. Apple's networking standard, AppleTalk, could push data at a relatively pokey (for a LAN) 230,400 bits per second. But that was plenty fast enough to quickly transmit *PostScript* code to the LaserWriter. Due to speed and memory concerns, HP limited its first LaserJet to no more than six square inches of graphics per page—in other words, a 2-inch by 3-inch rectangle. In contrast, the LaserWriter could output a full page of graphics at the user's discretion.

The company behind *PostScript*, Adobe Systems, Inc. (now Adobe Inc.), is today best known as the publisher of *Photoshop* and the PDF standard. But back in 1985 it was just another small Silicon Valley startup founded by former Xerox folks. John Warnock started working on the software that became *PostScript* back in the mid-1970s while working for Evans & Sutherland, a company that produced graphics equipment for flight simulators. Warnock eventually continued this work at Xerox PARC, but as he told C.W. Miranker of the *San Francisco Examiner* in February 1985, he was frustrated in actually bringing a product to market by Xerox's corporate bureaucracy. Eventually, he and a colleague, Charles Geschke, left to start Adobe Systems in 1982.

After two more years of work, *PostScript* made its debut on the Apple Laserwriter in January 1985. At the time, Miranker reported, Adobe only had 27 employees, and the company was kept afloat primarily by $2.5 million in funding from an investment banking firm. Apple had also acquired a 19-percent stake in the company.

Off the success of *PostScript*, Adobe launched a successful public stock offering in 1986, and it remains an independent, public company to the present day. John Warnock continued to serve as Adobe's CEO until 2000. He remains on the board of directors today.

Notes from the Random Access File

- This episode is available at the Internet Archive and has an original broadcast date of September 24, 1985.
- Bob Lamvik moved on from Okidata to serve stints as a vice president with the Santa Cruz Operation, Sun Microsystems, and Embarcadero Technologies. He served as president of his own company, asknet, Inc., in 2007 and 2008, and later co-founded Aegis Identity Software, Inc., where he was also CEO until 2016. Today, Lamvik continues to work as a business coach and a member of the executive staff of an insurance startup.
- Chuck Ulfers spent 36 years at Hewlett-Packard before moving to Oracle USA as a vice president in 2005. He remained with Oracle for seven years and currently runs his own consulting firm based in Colorado.
- John Dickinson began his tech writing career as a freelancer with *Softalk for the IBM* magazine in 1983. The following year, he jumped to *PC Magazine* and remained affiliated with that publication and its parent company, Ziff-Davis, until 1998. Today, Dickinson is retired and serves on the board of the Santa Cruz Symphony.
- I can't be sure, but I think John Dickinson was the first person to actually mention Microsoft Windows during an in-studio segment. Windows was not actually out yet when this episode taped in September 1985. The official release of Microsoft Windows 1.0 took place on November 20, 1985.
- Dickinson's reference to "LED array printers" threw me, as I'd never heard of that technology. Basically, these are similar to laser printers except they use a bunch of LEDs instead of a laser to transfer the image. There's a video on the YouTube channel Technology Connections that goes into LED printers, which apparently are still produced today.
- IBM touted the Quietwriter for, uh, being quiet. How quiet was it? An April 1985 review in *PC Magazine* said it rated at 53 decibels, which made it "less noisy than any other type of printer except for laser and inkjets." That said, the "ribbon advance and carriage return mechanisms make an annoying (though muffled) series of hacking and wheezing noises that make it sound like a sick puppy."

- The Hewlett-Packard LaserJet Plus was released in November 1985. It was the follow-up to the original LaserJet introduced in 1984. The main upgrade was to the on-board memory. The original LaserJet came with 128 KB, while the Plus had 512 KB.
- Atari Corporation ultimately was an exhibitor at the 1986 Winter Consumer Electronics Show. According to a report from Tom R. Halfhill in the April 1986 issue of *Compute!*, Atari was the “only major computer manufacturer in attendance” at the Las Vegas show, where it announced the 1040ST, the more powerful follow-up to the 520ST.
- Lotus Development’s Signal service enjoyed modest success but never became a major part of the company’s business. Lotus would sell its entire Signal business four years later, in October 1989, for $10 million to Infotechnology Inc. At that time there were about 10,000 Signal users.
- Jeff Raskin, who passed away in 2005, was the person credited with conceiving the Macintosh project at Apple. He left the company in 1982 and started Information Appliance, Inc., which produced the SwyftCard. Raskin later designed the Canon Cat computer, which he said was an attempt to create a machine more in line with his original vision for the Macintosh (before you-know-who hijacked the project).
- I skipped recapping Paul Schindler’s closing commentary because he didn’t really say anything interesting beyond repeating the point that computers and printers would not lead to a “paperless office,” which was also discussed in that “Random Access” item cited above.

Chapter 5: KRON-TV, USA Today, KCBS Radio, and the Aurora/75 Graphics System

Few industries were transformed more by the rise in computer technology than the media. This next *Computer Chronicles* episode from October 1985 looked at the interaction of computers and the media, with a focus on practical applications in the television, radio, and newspaper industries. The final segment also returned to a favorite topic of the show, computer graphics, where the work of one of the guests would help lead to the creation of a whole new form of media–the computer-animated film.

Was "Electronic Delivery" the Future of Newspapers?

George Morrow was this episode's co-host. Stewart Cheifet opened by demonstrating an online news service provided by Compuserve and running on a Macintosh. Cheifet said that in the past if you wanted this kind of information you would need to buy a newspaper or turn on the TV or radio. Now you could get the news whenever you wanted on the computer.

But Cheifet said that while there had been a lot of talk about the "electronic delivery" of the newspaper, not much had happened. Did Morrow think it would happen? Morrow said he didn't think people would give up newspapers. And if you combined online news services with a laser printer, pretty soon you would end up with a high phone bill and a high paper bill. Cheifet added that the computer would also allow you to customize the news to your interests.

The First Computerized TV Newsroom

This episode was heavier on remote segments than in-studio round tables. Wendy Woods presented the first of the three remotes, this one from KRON-TV in San Francisco, the first television station in the United States to fully computerize its news operation. Woods said that computers had become an integral part of the newsroom. And faced with the daily task of sorting through mountains of information, the news department was a natural choice for computers.

Woods continued her narration over some B-roll of a KRON reporter–Rollin Post, who passed away in 2011–going about his day. The reporter could obtain his assignment, the stories being worked on that day, and messages from his computer. The computer system carried wire service bulletins throughout the day, which were signaled by beeps rather than the clicking noises of a traditional teletype.

The reporter's job still required him to travel to locations, Woods said, to ask questions and take notes on a notepad. But with as many as 40 reporters in the field at one time and many fast-breaking stories arriving throughout the day, the computer streamlined the workflow.

KRON's associate news director, Robert Hodierne, told Woods that in the three years since computers were introduced to the newsroom, people had forgotten what it was like to do their jobs without the machines. In fact, every once in a while when there was a glitch, he said people would start to panic at the prospect of going back to using typewriters.

Overall, Hodierne said, computers sped things up immeasurably, often in subtle ways that were difficult to measure. For example, instead of having to get up from your desk and walk over to a clipboard to get wire service copy, you could get it right at your terminal. That might only save you 1 or 2 minutes but it added up over time. More importantly, the computer encouraged you to gain access to all of the information that was available to you.

Woods said that a reporter could use the computer to check the latest developments from the wire services while writing a story, list subtitles, and specify the pictures that should accompany the text. This information was then immediately accessible to the producers, editors, and artists who determined the final shape of the videotape package.

Another part of television that the computer had changed forever, Woods said, was the art department. Instead of slides and rough sketches, computer graphics now accompanied the text of a news story. Artwork and photos were combined to create a fast, flexible electronic library with a polished look.

But behind all of the computing power and convenience, Woods said, the sophistication of a network that links offices from San Francisco to Washington, DC, was one overriding concern. Hodierne noted that in the news business “speed” was very important. News operations scored their victories in minutes rather than days, and if you’re on-the-air three minutes before someone else with the big story, you won.

USA Today Used Computers, Satellites to Perfect National Distribution

Stewart Cheifet presented the next remote segment, this one focused on the national newspaper *USA Today*, published by Gannett. Ray Douglas, the systems director for the newspaper, told Cheifet that without computers, *USA Today* could not produce the kind of paper it did. Computers were used to collect news and information from various wire services, including the Associated Press, United Press International, and Gannett’s 85 local daily newspapers. The newsroom could also receive information from reporters in the field using portable computers.

All that information was then fed into one computer source, Douglas said, and once the pages for the newspaper were created and produced, the computer then took a facsimile image and converted it to a digital format, so that in roughly half-a-second it could be transmitted via the Westar 3 satellite to printing sites all across the country.

Cheifet said the *USA Today* computer system consisted of 12 DEC PDP-11/34 minicomputers running proprietary software. All 12 computers were networked and served only the editorial functions of the newspaper. Gannett had a separate mainframe that it used for corporate purposes, such as data processing and payroll.

While *USA Today* was probably the most computerized newspaper in the country, Cheifet said, it still did some basic things the old-fashioned way, such as page composition and layout. But Douglas said he hoped to enhance the computer system so it could take over those tasks as well. He said computerizing those functions would allow editors to make changes at a later deadline so that readers received a more up-to-date and precise product.

Douglas was also now experimenting with a computer system that let photographers in the field transmit color photographs back to the paper in the same way that reporters now sent text. He expected that in the short term it would be possible to transmit photos electronically and have them included in the next day’s newspaper.

To transmit the newspaper to its 30 printing sites around the country, Cheifet said *USA Today* used computer-controlled laser scanners with a resolution of 1,400 lines-per-inch. Computer-controlled “reconstructors” at each printing site then checked for errors, automatically requested the re-transmission of faulty scan lines, and produced a negative to make the final plates for printing the paper.

Back in the studio, Cheifet told Morrow that *USA Today* was perhaps best known for color graphics such as its weather chart, which ironically were still made by artists sitting at a desk. Morrow said that probably had to do with reliability. Microprocessors had been around since the mid-1970s but it was only now that industry felt comfortable enough with the technology to rely on it. After all, you didn’t want your television program going haywire in the middle of a segment–or miss your newspaper deadline either, Cheifet quipped.

Working in Radio Now Required Computer Training

Wendy Woods returned for our third remote segment, which profiled KCBS news radio in San Francisco. Woods said that everything the KCBS listener heard was compiled and written on a computer. Even the anchors read copy that was either printed out or displayed on their terminals.

KCBS was the first broadcast station to computerize, Woods said, creating a virtually paperless newsroom and a model for other broadcasters. The KCBS operation relied on 12 terminals hooked up to a minicomputer. The system had 140 MB of total storage–enough for 2 years worth of stories.

This system had been virtually bug-free since it first came into operation in 1979. Ed Cavagnaro of KCBS said that reliability was very important, and now more and more television and radio stations were using similar systems. Overall, he thought everyone was pleased with the computerized newsroom.

Valerie Coleman, a KCBS anchor, told Woods that she loved the computer system, noting it was clean, quiet, and efficient. The only problem she’d experienced was eye strain.

Woods said another issue with the computerized newsroom was the need for training. A reporter could not just walk into KCBS off the street without computer experience. Still, the computer had produced an accurate, efficient, and timely news operation. Indeed, the CBS network now had a similar system, only bigger.

Computer Graphics Revolutionized Television–But What About the Movies?

The only round table for this episode delved into the use of computer graphics and visual effects in the media. Dave Patton and Rodney Stock joined Cheifet and Morrow in the studio. There was also an Aurora/75 graphics system. Morrow asked Stock, the founder and president of the Computer Arts Institute, to explain the mix of hardware and software in the system. Stock said the hardware included a unique form of high-bandwidth memory that could store an entire image in one place. He said the software was also fairly sophisticated as it needed to handle a single image with a minimum of around 250,000 pixels, each assigned a specific color.

Morrow asked if the Aurora system would plug-in to something he could buy at his local computer store. Stock said the Aurora plugged into an IBM PC-AT and there were other graphics systems that could work with something smaller like an IBM PC/XT. Morrow asked if you needed a hard disk drive with this type of system. Stock said you typically would.

Cheifet then turned to Dave Patton, a vice president and co-founder with Prism Arts Group, for a demonstration of the Aurora, which was hooked up to an PC-AT, a graphics tablet, and two RGB monitors. Cheifet asked how much the system cost. Patton said the base price was about $32,500.

A man seated at a table using a stylus to draw on a graphics pad connected to two large video monitors.

Patton showed the Aurora generating a simple-cycle animation of a rotating galaxy. Morrow interjected with a follow-up question regarding price–was that $32,500 for the complete package or just the software? Patton said it included the hardware, although Stock clarified that CPU and the RGB monitors were not standard. Stock said that good RGB monitors would cost an additional $2,300 to $5,600 apiece.

Patton continued his demonstration, this time showing the image of a computer-generated cigarette with a simple animation cycle for smoke coming off the end. Morrow asked if it was possible to do cycle animation of the ash moving back to make it appear as if the cigarette was burning. Patton said that was possible and the tools were available to make that happen fairly easily. Stock added there was a more expensive Aurora system that could do those kinds of animations even more readily.

Morrow asked Stock if they taught these animation techniques at the Computer Arts Institute. Stock said they did.

Patton showed one final demo, this time of a title screen with snowflakes coming down around the text. This was actually done by painting striped rows of snowflakes down the screen but alternating the individual snowflakes between the background color (blue) and the snowflake color (white) to make it appear as if the snow was falling in a random pattern.

The round table then shifted to some discussion over B-roll of various computer graphics projects created by Pacific Data Images (PDI). (Some of the footage used here was previously seen in a June 1985 *Chronicles* episode where Wendy Woods profiled PDI and interviewed its founder, Carl Rosendahl.) Stock explained that PDI was a production house for computer graphics. They didn't buy or sell computers. Rather, PDI assembled its own hardware and proprietary software to generate computer graphics. Most of PDI's work was done for national accounts, such as NBC.

The B-roll started with various animated introductions produced by PDI for NBC and other television networks and stations. Cheifet asked about the cost of producing such intros and logos. Stock said specialty houses like PDI typically charged between $2,000 and $5,000 per second for 3D animation. Morrow expressed surprise at that figure, but Stock pointed out that these animations were used over and over again by national networks so they needed to look good.

Cheifet asked if there were any actual "cameras" involved in the animation process. Stock said no, everything was created digitally inside the computer and went through a frame buffer directly onto videotape. In response to a follow-up question from Morrow, Stock elaborated that the 3D images could be moved and viewed from any angle. He also noted the "soft edges" on the images. There was also no flickering–what was called *aliasing*–in the image field.

Stock then walked though how PDI used a combination of computer graphics and live-action models to create an animated introduction for a Brazilian television show.

A group of female dancers performing on a computer-generated stage.

The final sample piece shown was *Chromosaurus*, a PDI short featuring chrome dinosaurs running around an open landscape. Stock said this was a demonstration of where 3D graphics wanted to go. You used reality as a metric to establish your ability as an artist before going to surrealism. That is to say, once you could model dinosaurs and chrome, you could then have "chromosaurs."

Cheifet concluded by asking Stock–who previously worked on computer graphics for Lucasfilm–whether movies or television were the primary driver of this technology. Stock said it was primarily television. There were some uses of computer graphics in movies, such as a brief sequence done for *Star Trek II: The Wrath of Khan* by Lucasfilm, but it was such a specialized effect that there weren't that many movies using them.

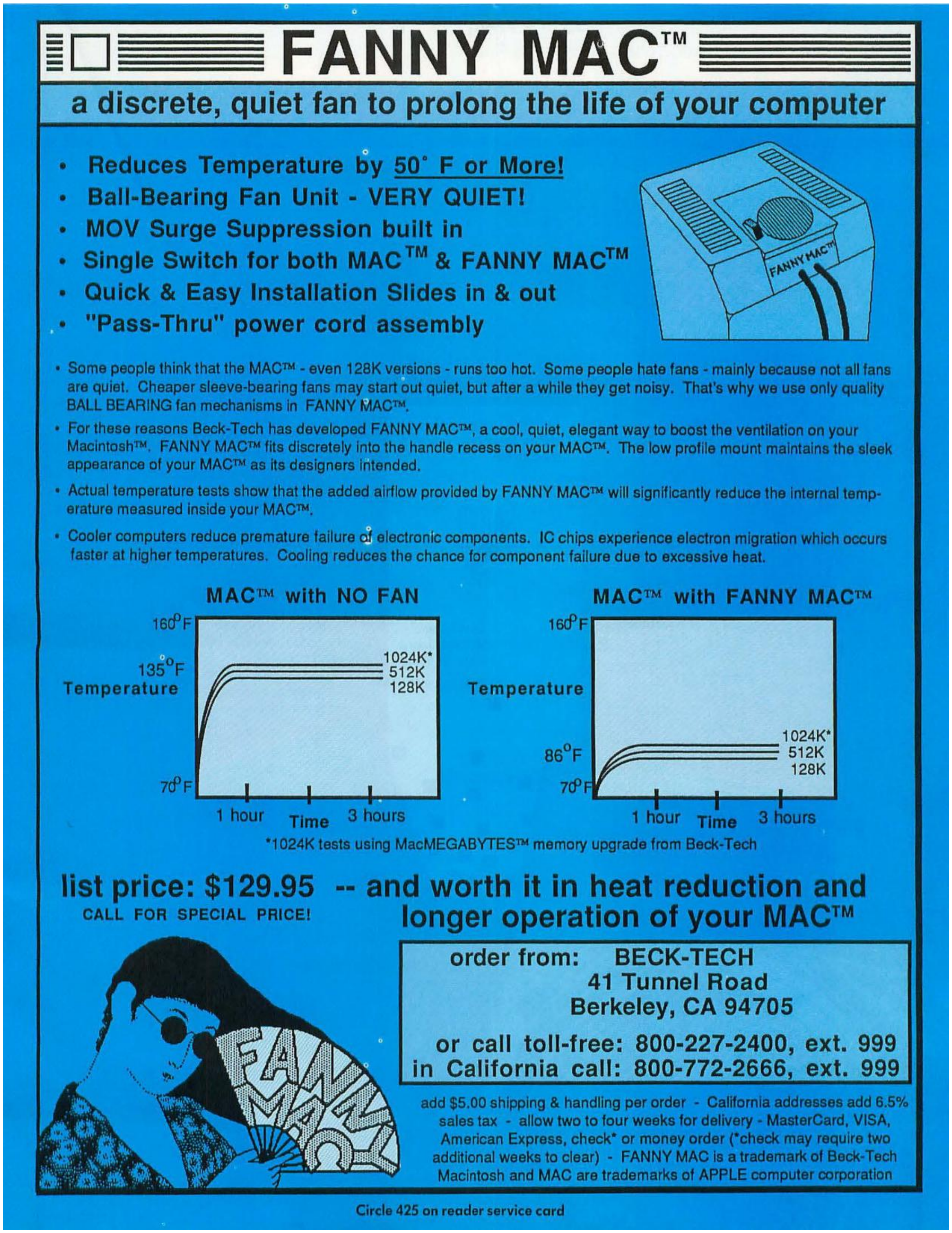
Apple Cut Prices, ETAK Offered First In-Car Navigation System

Stewart Cheifet presented this episode's "Random Access," which was recorded on or about October 5, 1985:

- Cheifet said computer makers were starting early with their holiday price cuts. Apple announced the price of an Apple IIc with a black-and-white display would now be $995, down from $1,295; and the Apple IIe with 128 KB was now down to $945 from $1,145. Apple also announced price cuts for the Macintosh and the color version of the IIc.
- IBM released a new version of the PC-AT with a 30 MB hard disk drive. It would sell for $200 more than the current version of the AT with a 20 MB hard disk.
- Apple and Digital Research settled a lawsuit over allegations that GEM violated the copyrights on the "look and feel" of the Macintosh operating

system. Digital Research agreed to modify its software. (I covered this settlement in a previous blog post.)

- Just weeks after Steve Jobs left Apple, Cheifet quipped, there was already a cooling fan now available for the Macintosh. (Jobs detested fans and refused to put one in the Mac.) Beck-Tech now offered a fan that promised to reduce the inside temperature of the Mac from 135 degrees (Fahrenheit) to 86 degrees.



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Circle 425 on reader service card

A 1986 magazine advertisement for Fanny Mac, described as “a discrete, quiet fan to prolong the life of your computer.”

- Sen. Paul Trible of Virginia agreed to amend his proposed bulletin-board pornography bill to meet the objections of the ACLU and several BBS

operators. Cheifet said witnesses told a Senate subcommittee that there were hundreds of boards around the country that were dealing with child pornography. (The bill never actually made it out of the Senate.)
- The Soviet Union decided to buy MSX computers from Japan, ordering over $1 million in machines for use in schools.
- Paul Schindler reviewed *Bakup* (InfoTools, $150), a hard-disk backup program. Schindler said "no matter how hard I try," he couldn't make any mistakes while using the program.
- ETAK was now selling a $1,500 product for cars called Navigator. The device displayed a map of the driver's location and destination on a CRT screen. Cheifet noted the Etak did not rely on radio signals. Rather, it used an electronic compass, motion sensors, and a computerized map database. Etak claimed its Navigator was accurate to within 50 feet.
- The nation's biggest piano-roll maker said it was converting 10,000 of its piano rolls into floppy disks that can be played back through a Commodore 64 or Apple IIc.
- A computer scientist used a $10 million Cray X-MP supercomputer to discover what was (so far) the world's largest prime number–2 to the 16,091st power minus 1. This number had over 65,00 digits, Cheifet said, and replaced the prior largest prime number discovered just two years earlier.

Aurora Was Yet Another Orphaned Xerox PARC Project

In his closing commentary, Paul Schindler predictably lamented the growing encroachment of computers upon the traditional newsroom. He said that while the "news was fresher" thanks to computers, the final product didn't "flow as well as it used to." And while news copy was now written faster, that didn't mean it was necessarily better. One can only imagine what Schindler–long retired from the industry–thinks about the central role that Twitter and social media now plays in journalism. (Paul does have a blog but I've never seen him on Twitter.)

Of course, this *Chronicles* episode aired more than a decade before the Internet started to seriously disrupt the traditional model of journalism. And as George Morrow observed, there was no immediate threat to print newspapers in 1985 given the cost of accessing information through a service like Compuserve, which still charged for access by the hour. Indeed, even today when many news sources are wholly online there are still newspapers that publish print editions, including the venerable *USA Today*.

But this episode was definitely focused on how computers were used by the media industry itself rather than consumers–who after all were still buying newspapers and listening to the radio. The Aurora/75 was a good example of how the market for 3D computer graphics was definitely not ready for the average PC desktop. According to a June 1984 article by Dick Phillips for the *Santa Rosa Press Democrat*, a full-blown Aurora system cost about $130,000. The first such system was actually sold to KRON-TV in San Francisco, and by mid-1984, Aurora Systems said it had sold a total of 25 units.

If you're playing the *Computer Chronicles Revisited* drinking game, you can take a shot now, as Aurora Systems itself was started by–wait for it–a former Xerox PARC employee, in this case Richard Shoup. Shoup, who died in 2015, developed his first prototype for a computer paint system, known as Superpaint, while still at PARC, but he told Philips that "Xerox wasn't paying much attention to it," as management didn't see the system as a practical means of producing business graphics.

In 1977, Shoup offered his Superpaint system to Damon Rarey, the graphics director for a daily magazine program produced at KQED-TV in San Francisco, for free if he could "find a use for the system on the show." Shoup and Rarey ended up becoming partners and co-founding Aurora Systems in 1980. Rarey also started Prism Arts Group as an illustration and animation company to service corporate clients.

Aurora Systems was acquired by New York-based Chyron Corporation in June 1994. As I explained in a prior post, Chyron itself merged with Sweden-based Hego AB in 2013. As for Prism, it dissolved shortly after Rarey's death in 2002.

Stock Co-Founded Pixar

Although the final segment of this episode focused on the work of Pacific Data Images–the company that would go on to become the feature film studio DreamWorks Animation–Rodney Stock was actually a co-founder of what became PDI's main "rival" in the computer graphics space, Pixar.

Stock got his start engineering flight simulators for Evans and Sutherland, an early computer graphics firm, in the 1970s. He then worked at Ampex where he worked on a digital paint system (not the Aurora). By the early 1980s, Stock was the graphics engineering manager at Lucasfilm, where he led the team that developed what became known as the Pixar graphics computer. As Stock noted on *Chronicles*, one of the first finished animation pieces produced by his division was a one-minute sequence seen in *Star Trek II*, where Dr. Carol Marcus made her crowdfunding pitch for the Genesis project.

George Lucas' divorce prompted him to sell off the computer graphics arm of Lucasfilm to Steve Jobs in February 1986, about four months after this episode aired. Jobs took a majority interest in the company with Pixar's 43 employees, including Stock, receiving the remaining shares. At the time, there was no talk of Pixar getting into the feature film business. To the contrary, Jobs saw Pixar as a hardware company and initially planned to sell the Pixar computer itself at $125,000 a pop.

As for Rodney Stock, I could not find any definitive information on his activities since the mid-1980s. As Cheifet mentioned, Stock did serve as founder and president of the Computer Arts Institute, a private school that provided specialized courses in computer graphics. As best I can tell, the Institute fizzled out sometime in the late 1990s.

Notes from the Random Access File

- This episode is available at the Internet Archive and has an original broadcast date of October 10, 1985.
- There were two episodes broadcast in between this one and the last one that I covered. Unfortunately, they are among the episodes still missing from the Internet Archive.
- Robert Hodierne had a long career in journalism starting with his work as a photographer covering the Vietnam War. He joined KRON-TV as its associate news director in 1983 and remained there until 1986. In 1987, he took a sabbatical from journalism and spent the next three years sailing around the Pacific Ocean before settling in Japan. He returned to journalism in 1993. In 2008, he joined the University of Richmond in Virginia as an associate professor of journalism and taught there until his retirement in 2021.
- Ray Douglas (1949-2007) left *USA Today* in 1990 to join the *New York Times*, where he ultimately became chief information officer for the newspaper's parent company. Douglas retired in 2001 and passed away in 2007.

- Ed Cavagnaro joined KCBS Radio in 1977 as a promotion assistant. He moved to the newsroom a few months later and remained there until 2015, when he retired after serving as news and programming director since 1988.
- Valerie Coleman–now Valerie Coleman Morris–worked at KCBS on both the radio and television sides in the 1980s. In 1994, she joined CNN as a business anchor and remained with the network for 12 years. Since 2007, she's been an author and speaker promoting financial literacy to women and people of color.
- Dave Patton joined the advertising agency Pittard Sullivan in 1991 and remained there for a decade, primarily working out of its Munich, Germany, office. After a four-year stint at Starz Entertainment in the early 2000s, Patton is now retired and living in Nevada where he runs his own fine art photography studio.
- Star Seimitsu was the Japanese company that sold those MSX computers to the Soviet Union. According to contemporary reports, the USSR purchased 4,000 8-bit computers at a total cost of $1.2 million.
- Anti-BBS porn crusader Paul Trible only had a brief career in the U.S. Senate, serving a single term representing Virginia. But he recently announced his retirement after more than 25 years as president of Christopher Newport University.
- ETAK was started in 1983 by a group of six former employees from SRI International. Atari co-founder Nolan Bushnell provided the initial funding. The digital road map database component of the Navigator later attracted Rupert Murdoch's News Corporation, which acquired ETAK in 1989. But as ETAK co-founder Stan Honey noted in a history of the company, things came "full circle" as ETAK's assets were ultimately merged into TomTom N.V., the Dutch company that produces modern-day satellite navigation devices for cars.
- David Slowinski was the computer scientist who discovered what was then the largest-known prime number. The record only stood for about four years. In 1989, a group known as the Amdahl 6 discovered a prime number that was 37 digits longer than the one found by Slowinski. The Amdahl 6 record has since been broken many more times. As of March 2022, the largest known prime number has over 24.8 million digits.

Chapter 6: The WELL

A “Random Access” item in the last episode discussed a 1985 bill introduced in the United States Senate, S.1305, which proposed to prohibit anyone from “knowingly entering or transmitting by means of a computer” any content related to child pornography. Although similar legislation is now on the federal statute books, this particular bill never made it out of the Senate despite enthusiastic support from then-President Ronald Reagan’s administration.

There was substantial resistance to S.1305 from civil liberties advocates and the tech industry, who feared the legislation would stifle the nascent computer bulletin board system (BBS) market. In a February 1986 *Baltimore Sun* column, David H. Rothman cited one BBS operator–who happened to be a lawyer–who said, “Just word of one prosecution would be enough to frighten some board operators” into shutting down completely. The problem, Rothman explained, was that the word “knowingly” in S. 1305 could implicate honest BBS operators who were simply too overwhelmed to monitor their users’ posts 24 hours a day. For example, another operator he spoke to said that he made a diligent effort to prevent users from illegally posting people’s credit card numbers, yet “[n]umbers went up [] before he could zap them, and authorities subjected him to a legal battle.”

A decade later, Congress passed the Communications Decency Act, which included the famous Section 230, a provision that largely immunized providers of “interactive computer services” from any legal liability for posts made by their users. But in these earlier, pre-Internet days, BBS operators were still viewed with a good deal of skepticism by many lawmakers and perhaps the public at-large.

This next *Computer Chronicles* episode from October 1985 discussed the growing legal issues surrounding bulletin board systems. It also provided a broader overview of the growing impact of modem technology on computer usage. There was even a demonstration of a specific BBS that grew into one of the earliest–and still active–online communities.

“Missing Half the Fun of Owning a Computer”

Stewart Cheifet did his cold open seated at a desk using an Apple IIc hooked up to a modem. He said that if you owned a computer and a telephone, but you didn’t own a modem, you were missing half the fun of owning a computer.

George Morrow was back this week as co-host. In the studio, Cheifet worked at another, unidentified computer, which he used as a terminal thanks to a modem. Cheifet asked Morrow to explain what a modem was and what it did. Morrow said that the information stored in a computer was commonly identified as “0s and 1s,” which typically represented electric voltage levels. At the same time, information that went over the telephone line was represented by tones. The modem represented an “agreement” over how to turn the computer’s voltage levels into telephone tones. “Modem” meant *modulator-demodulator*: Modulating turned the voltage levels into tones; demodulating did the reverse.

First-Time Parents Turned to Apple-Funded Daycare BBS

Wendy Woods presented her first remote segment from Parents Place, a daycare center and preschool in San Francisco. Woods explained how Parents Place recently added a computer BBS–funded by a grant from Apple–to help parents who were too busy to visit the center personally for support services. The BBS was available every day from 5 p.m. to 9 a.m. It offered up-to-date articles on child rearing and answered questions on typical childhood events, such as temper tantrums and toilet training.

Woods said one of the most popular aspects of the BBS was the interactive sharing of experience between new (and often unsure) parents. Parents Place still kept an open telephone line for voice communication, but the popularity of the BBS was growing steadily. First-time parents could get answers to questions that might be difficult to ask face-to-face.

Woods noted the BBS had also been used as a “survey taker,” a trading post, a teacher, and a referral guide. But mostly, it was a quiet place for parents to share their common fears and feelings about parenthood.

Would Computers Eventually Outnumber Typewriters in American Homes?

The first of two studio round tables featured Ezra Shapiro and Rory O’Connor. George Morrow opened by noting he had “a heck of a time” working with modems. But he said that Shapiro and O’Connor, who were both tech journalists, probably used modems an awful lot, so maybe they could explain how they worked with bulletin board systems. O’Connor, the news editor for *InfoWorld*, said they’d been using modems and telecommunications for a number of years. The most common uses were to gather stories from journalists in the field and communicate internally through an electronic mail system. He said these systems made it possible to easily share stories and notes with other bureaus, and even other publications owned by his publication’s parent company. For example, O’Connor could ask someone in Europe to do an interview for him and send the transcript electronically.

Morrow asked if this was done frequently. O’Connor said absolutely, noting that a recent front page story in *InfoWorld* required two interviews done in Europe and sent to him via electronic mail a few hours later. Cheifet asked why this was better than simply calling the reporter in Europe on the telephone. O’Connor replied that one problem when dealing with Europe or Asia was the time-zone difference. If you picked up the phone in the middle of the day in San Francisco, it was 3 a.m. in Paris. Another reason was that if he simply spoke to the local reporter in Europe, he would still need to have a third person transcribe the conversation onto a local computer.

Cheifet turned to Shapiro, the west coast editor for *Byte* (a presenting sponsor of *Computer Chronicles*), who also ran his own BBS. Cheifet asked Shapiro to explain how his BBS, which was based on software known as *Fido*, worked. Shapiro said he’d been “sort of a nut” about bulletin board systems for the past three years. So he set up his own BBS, which ran off his personal computer even when he wasn’t using the machine. He described it as a “community chat center” and source of public domain software programs.

Morrow asked about the type of programs available on the BBS. Shapiro said it was basically stuff that he was interested in, such as software for the TRS-80 Model 100 computer, fairly technical programs for the IBM PC, and even an area for the BBS software itself. This meant someone could call Shapiro’s BBS and download the software to start their own bulletin board.

Morrow asked about the costs and complexity of starting your own BBS. Shapiro said that with respect to complexity, all this stuff was confusing and required reading through manuals to figure it out. And because most bulletin boards ran off of public domain software, these programs were not very well documented, so a new operator should plan to spend a good deal of time in the setup process. As for the costs, purchasing a computer, modem, and a second phone line could run you between $600 and $700.

Cheifet asked O’Connor how the average computer could decide which was the best modem for them. O’Connor said it depended on what the user wanted to do, i.e., what kind of information they wanted to get on the other end. Shapiro said he recommended joining a local computer club or users group. There was always someone in these groups who had already paved the way a few months earlier. Morrow agreed that one of the best resources available for computing were user groups.

Cheifet turned to the issue of how people behaved on a bulletin board. What were O’Connor and Shapiro’s observations about the social and psychological aspects of communicating via modem? O’Connor said it certainly was different than communicating via telephone, because to a certain degree you were insulated. You could choose to back out of a conversation and listen, similar to a telephone party line.

Morrow asked if people were more or less “adventuresome” in this online environment. O’Connor noted there were the equivalent of personal ads and computer dating on bulletin boards. He said there were also boards that focused on specialty interests ranging from the unusual, like survivalists, to more outrageous topics like pornography.

Cheifet asked Shapiro if he behaved differently on his own BBS. Shapiro said that as the board operator he was more of a “puppetmaster” working behind the scenes. But when he logged onto another BBS or a larger service like Compuserve or The Source, he’d seen quite a few things that indicated people were dealing with online communication differently. When people typed letters and numbers on a keyboard, they disappeared quickly, and they could be anything they wanted to be behind those letters. He noted there had been a number of romances started online that had led to marriage. (Morrow expressed surprise at this.) On the other side, there was a woman who attempted suicide while logged into an online service. Fortunately, another user saw this was serious and intervened.

Cheifet asked if bulletin boards were a fad, similar to CB radios back in the 1970s. Or was this a new, permanent way for people to communicate with each other? O’Connor said that according to a market research study recently cited in *InfoWorld*, by the end of the 1980s a majority of the American white-collar workforce would have the opportunity to use modems and computers to work from home–what they called *telecommuting*. So O’Connor saw bulletin boards gradually increasing in popularity, although the complexities still had to be addressed.

Morrow went off on kind of a weird tangent here, asking how we could ever expect to see more computers in homes than typewriters. He estimated that no more than 60 percent of American homes currently had typewriters. So why would more homes have computers? O’Connor said many corporations might one day provide their workers with low-cost communications terminals. Morrow joked the IRS would probably find a way to tax that as income.

Pacific Bell Launched Pilot “Telecommuting” Program

Speaking of telecommuting, Wendy Woods presented her second remote segment, this time focused on Pacific Bell. The San Francisco-based telephone company was now experimenting with its own telecommuting program. Woods narrated some B-roll footage of Steve Renten, one of 75 Pacific Bell employees who were part of the pilot program. Renten spent 20 hours per week compiling data for Pacific Bell’s marketing department from his home computer. Renten then sent his reports via modem to the company’s time sharing network.

Renten told Woods that telecommuting was wonderful. He was more productive, experienced greater clarity of thought, and produced more consistent work. And it saved him the cost and hassle of commuting. Woods noted, however, that those involved in the test spent some time at the office as “human interaction” was still considered a vital part of doing business.

Telecommuting also had benefits for the employer, Woods noted. Lynda Aanpol, the manager in charge of Pacific Bell’s telecommuting program, told Woods there was reduced overhead from office space savings, improved recruiting of new employees, and even reductions in time-sharing costs, as employees could access mainframes during off-peak hours.

Woods said that Pacific Bell estimated there were 7.2 million Americans who could be working at home. For its part, Pacific Bell expected to increase the number of telecommuters at its company to about 100 over the next few months. Woods noted it was appropriate that one of the first companies to embrace telecommuting was, in fact, a telephone company.

Should BBS Operators Be Held Legally Responsible for Criminal Posts by Users?

Back in the studio, Matthew McClure and Don Ingraham joined Cheifet and Morrow for the second and final round table. McClure was a systems operator with *The WELL*, a recently launched BBS service. McClure told Morrow that anyone with a computer and a modem could access *The WELL* and its hundreds of other users. Morrow asked why someone would use *The WELL* instead of a telephone. McClure said when you posted a question to a BBS, you reached 100 or 200 people and might get an answer back within roughly 24 hours. It would take you far longer to call that many people individually.

McClure than demonstrated *The WELL* running on a Macintosh attached to a modem. He explained there were a number of user groups active on the service, so if you had a technical question about a computer, you could post a question. There was also public domain software available. But he said the more interesting stuff was with a variety of real-world topic areas–which *The WELL* called “conferences,” on topics such as spirituality and legal issues.

Morrow asked about a conference simply called “the pub.” McClure said that was a “corner pub” where users went to relax. (The users had to provide their own liquor.) McClure also showed off a legal conference discussing S.1305. One user had posted the full text of the bill.

Cheifet then turned to Ingraham, an assistant district attorney for Alameda County–where they kept the nuclear wessels–who specialized in prosecuting computer crimes. Cheifet asked Ingraham how the law currently viewed bulletin boards. Were they like newspapers with First Amendment rights or were they considered utilities subject to government regulation? Ingraham said federal and state lawmakers were currently struggling with that question. And even if laws were eventually passed to regulate bulletin boards, the courts would still need to decide which First Amendment protections applied to this kind of online communication.

Ingraham noted that conversations on BBS services could take place over a long period of time. So who was responsible for what any particular person said? A newspaper would not publish someone’s personal credit card number. Indeed, you could sue a newspaper that did that. But people did post credit card numbers on bulletin boards.

Ingraham noted that S.1305 was specifically targeted at child pornography and child abuse on bulletin boards. He said there were boards targeting people were interested in–and in fact obsessed with–committing sexual attacks on children. A BBS afforded an advantage of anonymity that did not exist with paper.

Morrow asked McClure if there was any way to know where a call made to *The WELL* originated. McClure said not really, noting that anyone could sign up. Cheifet noted that a systems operator like McClure might be liable under S.1305, so what kind of control did he have–or ought to have–over what people put on a BBS? McClure said it was a double-edged sword. On the one hand, there was the issue of control. On the other hand, there was the privacy of users. He said most BBS operators, including himself, erred on the side of privacy, especially when it came to private electronic mail. If he were legally responsible for every word that anyone put on *The WELL*, it would be a burdensome task and most people wouldn't bother running a BBS.

Morrow asked McClure if it was practical for him to edit a problematic post in real time, say someone who had posted a credit card number. McClure said it would be impossible for him to know that it had even happened. *The WELL* was a multi-user system with about 30 people logged on at once. So he couldn't keep track of when every individual user was typing something. Morrow lamented this was a real problem.

Cheifet asked Ingraham if it was a mistake for BBS operators like McClure to err on the side of privacy. Ingraham said it was probably the right approach if we were talking about the legal issue. He said the last thing any legislator wanted was to destroy something with the potential for national communications that a BBS afforded. "There will always be snakes in Eden," he said. He saw the problem as one of some BBS services actually encouraging criminal activity. Every BBS prosecuted by his office had actively provided information on committing crimes, such as how to hack into a computer system or rip off the telephone company. But Ingraham said the typical BBS operator like McClure would be no more criminally responsible for someone posting a credit card number than a supermarket manager would be if someone did the same thing on a physical bulletin board.

Cheifet asked if that still didn't put pressure on BBS operators to make certain judgments or close calls, such as someone who simply wanted to talk about their child pornography addiction. Ingraham said that was a risk we had to run with a new technology. Morrow added that when it came to social problems there were two attitudes to take: just fix the problem, or be careful about fixing it because maybe you'll make it worse.

Finally, Cheifet asked McClure if he found himself getting more conservative due to pending legislation. McClure said it was a growing concern, noting that Pacific Bell recently raided a BBS and seized $6,000 worth of equipment because of posts containing credit card numbers. The next day, McClure said a number of bulletin boards started requiring registrations, passwords, and even user fees.

Paul Schindler provided his customary closing commentary, which focused on the issue of online etiquette. He noted that bulletin boards were still “primitive,” not technically but socially. He saw an opportunity in someone trying to be the Emily Post or Miss Manners of the BBS world, as some boards desperately needed such help.

Intel Launched 386 Processor

Stewart Cheifet presented this episode’s “Random Access,” which included news from October 1985.

- IBM launched its new local area network system, a token-ring system that was not compatible with Ethernet and would not work with mainframes or minicomputers. The software and hardware cards to operate the new LAN would cost about $800 per workstation. IBM claimed the system could link up to 200 computers and peripherals. Cheifet said other vendors were expected to “hop on board” the IBM standard to develop compatible networking products. (IBM’s token ring system will be the subject of the next *Chronicles* episode.)
- Intel unveiled its new 32-bit microprocessor, the 80386, which was “essentially a mainframe on a chip.” IBM would reportedly use the 386 in its planned successor to the PC-AT, which was expected to be out in 1987. Cheifet noted that the 80386 could access 250 times more data than a 16-bit chip.
- Kaypro cut the prices of two of its PC compatibles, the 16e and the 16/2e, by about 20 percent.
- Swedish manufacturer Ericsson said it would exit the U.S. desktop computer market and focus on telecommunications and networking products instead.
- Digital Equipment Corporation announced a new CD-ROM drive for its DEC Rainbow 100 computer as well as the IBM PC. The company would also sell databases on Laserdisc.

- Paul Schindler reviewed *NFL Challenge* (Xor Software, $99), a NFL-licensed computer football game that portrayed the action using X-and-O diagrams. Schindler was particularly happy that the game was not copy protected so it could be run from a hard disk drive.
- Tsuneo Tanaka, the president of Hitachi America Ltd., backed out of a planned appearance before a U.S. Senate committee looking into allegations that the Japanese company was “dumping” computer chips onto the American market at “predatory” prices.
- Cheifet said the computer industry was “up in arms” about a proposal before the Ways and Means Committee of the U.S. House of Representatives that would “drastically” reduce tax breaks for high-tech research and development. A Hewlett-Packard executive claimed the cuts would cost his company $100 million a year.
- Soviet spies were reportedly using *Dialog*, an online database created by defense contractor Lockheed, to research U.S. military technology projects.
- Ziff-Davis planned to close *Creative Computing*, one of the original computer magazines, by the end of 1985.
- The 1985 North American Computer Chess Championship recently opened in Denver. The favorite was HiTech, a computer created at Carnegie Mellon University. Cheifet said that HiTech’s designer predicted that a computer would one day be the world’s best chess player.
- ThoughtWare released the *Jingle Disk*, which Cheifet described as the “ultimate high-tech Christmas card.” The program ran color holiday scenes and played Christmas carols. (Clint Basinger of the YouTube channel LGR did an extended review of *Jingle Disk* and the company behind it in a 2014 video, which I’ve embedded below.)

{{< youtube id=“yUnb-AoFyTY” title=“Lazy Game Reviews - Jingle Disk for DOS Review - 12 December 2014” >}}

The First Social Network?

If you ask Google, “What was the first social media platform?”, most of the responses direct you to SixDegrees.com, a web-based service launched in 1997. But I think there’s a case to be made that *The WELL* could be considered the first social media network. Although *The WELL* never achieved a critical mass of users–especially when compared to other early online services–it proved to be quite influential within the technology press itself and helped to spawn a number of institutions that remain prominent today.

Now, *The WELL* was not the first BBS. Back in 1978, a Chicago-based duo, Ward Christensen and Randy Suess, developed the first BBS software–known as *CBBS*–to help their computer club stay in touch following a blizzard. By the early 1980s there was a wide number of BBS programs available, including Fido, which Ezra Shapiro mentioned powered his own self-hosted board. For its part, *The WELL* relied on a proprietary "computer conferencing" tool called *PicoSpan*, first developed in 1982 by Marcus D. Watts.

Watts, however, was not the person behind *The WELL*. That honor belonged to two other men, Stewart Brand and Larry Brilliant. Brand is a figure whose prior work has been indirectly mentioned on the *Chronicles* before. He was behind the *Whole Earth Software Catalog*, the publication that briefly employed Paul Schindler. The *Software Catalog*, in turn, was a spin-off of the *Whole Earth Catalog*, which Brand launched back in 1968. As Fred Turner, a Stanford University professor, described in a 2005 paper on the origins of *The WELL*, Brand was "a former Merry Prankster and coproducer of the Trips Festival that helped spark the Haight-Ashbury psychedelic scene."

Basically, Brand was a young white man who had inherited some money and decided to fund a hippie commune. The *Whole Earth Catalog* was part of this communal movement. The *Catalog* did not actually sell products. Rather, Turner said it "presented reviews of hand tools, books, and magazines arrayed in seven thematic categories"–kind of a Yelp for commune members. Although Brand intended the *Catalog* to be a one-time affair, its popularity led him to publish a number of quarterly "supplements," which later spawned a separate magazine, the *Whole Earth Review*. In 1983, Turner said Doubleday offered Brand a $1.3 million advance–which the publisher would never earn back–to produce the *Whole Earth Software Catalog*.

It was around this time that Larry Brilliant entered the picture. Katie Hafner, whose history of *The WELL* was the cover story in the May 1997 issue of *Wired* (and which led to a whole book on the subject), described Brilliant as a "physician whose career had been a mix of good works and business ventures." Brilliant, who also once belonged to a commune, had purchased a Michigan-based company called Network Technologies International (NETI), which happened to employ Marcus Watts part-time. NETI purchased the rights to *PicoSpan* from Watts, and Brilliant wanted Brand to use the software to create a "computer conferencing" network built around the existing *Whole Earth* community. Hafner said Brilliant's goal was simple: "take a group of interesting people, give them the means to stay in continuous communication with one another, stand back, and see what happens."

In its initial form, *The WELL* was little more than a DEC VAX computer provided by NETI and a rack of modems running out of the existing *Whole Earth Review* office. (*The WELL* itself stood for "Whole Earth 'Lectronic Link.") The system went online internally in March 1985 and opened to the public on April 1.

Matthew McClure was *The WELL*'s first employee. McClure previously belonged to a Tennessee commune called The Farm. After leaving the commune in 1983, McClure joined the *Whole Earth Software Catalog* as an assistant editor. Brand decided that McClure's experience living on a commune–and presumably with UNIX, the VAX's operating system–made him an ideal candidate to lead his new online community as director. McClure himself did not stay on the job very long. He left *The WELL* in 1986. His successor was John Choate, another veteran of The Farm, whom McClure initially hired as his marketing director. McClure bounced around a number of software engineering jobs during the 1980s and 1990s, most notably a decade-long stint with enterprise software company Sybase. His last major job was with Kibo Software, from where he retired in 2016.

As for *The WELL*, at the time this *Chronicles* episode aired, the service only had a few hundred users. Even at its height in the mid-1990s, *The WELL* never exceeded 10,000 members, according to Hafner. Still, Hafner noted that *The WELL* "had become a force whose influence was wildly disproportionate to its size." Many journalists, including Hafner, belonged to the service–Brand offered them free memberships–which prompted a good deal of coverage.

Still, press buzz did not translate into rapid growth. Indeed, *The WELL* struggled to keep up with what users it did have. As Hafner explained, the choice of the VAX to run the whole system "had probably been Stewart Brand's biggest mistake." The command-line UNIX interface behind PicoSpan also created a significant barrier to entry for non-technical users. And Brand's desire to keep the service as close to free as possible meant *The WELL* lost money in its early days. By 1986, Hafner said that Larry Brilliant's board advised him to "dump the hippies" and write-off NETI's $400,000 investment in the project.

NETI would actually hold on to its 50-percent stake in *The WELL* until 1994, which it then sold to Bruce Katz, who is best known as the founder of the Rockport Shoe Company. (The nonprofit Point Foundation, which published the *Whole Earth Review*, owned the other 50 percent.) Katz moved *The Well* onto the Internet and ultimately decided to split the business into three separate entities: the original service containing all of the user-generated content; an Internet access provider; and a software company that would market a graphical, web-based conferencing system.

Katz would sell the core *WELL* service to the Salon Media Group, publishers of *Salon*, in April 1999. *Salon*'s founders were themselves members of *The WELL* and had actually "planned their business in a private forum" on the service, according to *ZD Net*. Salon continued to run *The WELL* for 13 years until it sold the service to a "group of long-time members" who paid $400,000, according to *The Guardian*, which noted there were about 2,700 members as of 2012. Ten years later, *The WELL* continues to operate as an independent company. As for legacy, in addition to *Salon*, there are two other notable ventures that can trace their lineage to member conferences on *The WELL* are the Electronic Frontier Foundation and Craigslist.

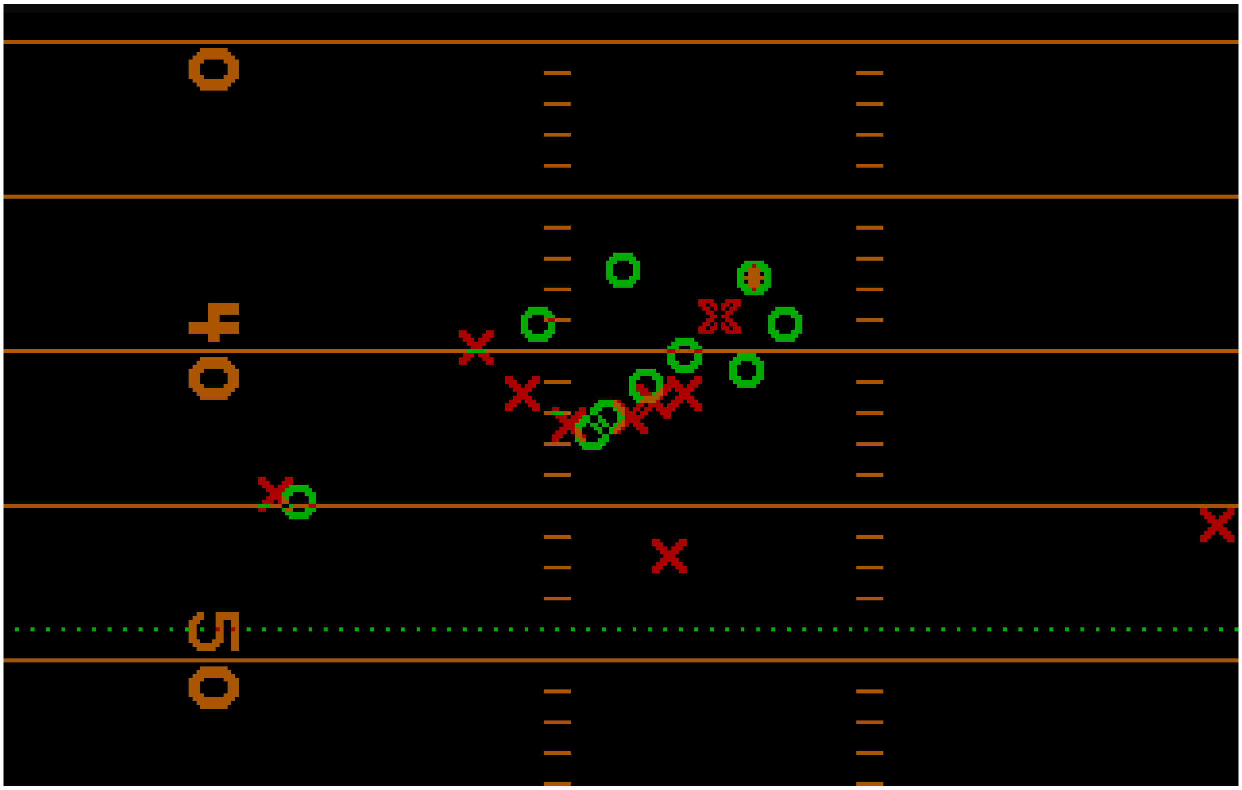
And as I suggested earlier, *The WELL* can be thought of as the first social media network. One reason for this is Stewart Brand's early credo for the service, "You own your own words." No doubt, this was partly a self-serving move designed to shift any potential legal liability away from Brand and onto the users. But it also established a clear policy that content generated by the users belonged to them, not the service. For example, users had the right to delete (or “scribble”) any or all of their posts to a conference. This reflected a clear shift from other online services like Compuserve or The Source, which were largely proprietary databases of information that users could access but not directly control.

Notes from the Random Access File

- This episode is available at the Internet Archive and has an original broadcast date of October 22, 1985.
- Donald Ingraham (1937 - 2008) spent nearly 35 years with the Alameda County District Attorney’s office. The United States Army drafted Ingraham shortly after he passed the California bar exam and he spent four years in the Judge Advocate General’s Corps, rising to the rank of captain. Following his discharge in 1967, Ingraham joined the district attorney’s office and remained there until his retirement in 2001. Ingraham died in 2008 following a six-year battle with Alzheimer’s disease, according to an obituary published by his son, Lawrence Graham.
- Don Ingraham was also an accomplished puppeteer. I found a number of newspaper clippings advertising shows that he performed for children in the Oakland area during the 1980s. According to his son, Ingraham happened to be a high school classmate of Frank Oz, the legendary puppeteer and director who worked with Jim Henson on the Muppets.
- I couldn’t find much on Ezra Shapiro. He taught journalism for a number of years at California State University, Northridge, but he does not appear to be active in journalism or academia anymore.
- Rory O’Connor remained with *InfoWorld* until 1987. He continued to work as a journalist for various publications until 2001, when he moved into corporate communications. Since 2015, he’s worked as a self-employed communications consultant based in San Francisco.
- Carnegie Mellon’s HiTech did in fact triumph at the 1985 North American Computer Chess Championship. Thimichas was the 16th annual event sponsored by the Association for Computing Machinery, whose president at the time was recent *Chronicles* guest Dr. Adele Goldberg. And just as one of HiTech’s designers predicted, a computer

would defeat the world chess champion. IBM's Deep Blue–originally developed at Carnegie Mellon–defeated Garry Kasparov in a six-game match in May 1997.

- Ericsson's foray into the U.S. computer market seemed to consist of a single product, the Ericsson Portable PC, an IBM PC clone that came with an optional thermal printer and modem.
- Compaq ended up beating IBM to market in releasing the first 80386-based PC. The Compaq Deskpro 386 debuted in September 1986. The 80386 itself ended up enjoying a very long lifespan–Intel continued producing variations of the 32-bit chip up until 2007.
- That DEC CD-ROM drive initially sold for around $2,300, according to contemporary news reports.
- *Creative Computing* launched in October 1974. Its founder and editor was David H. Ahl, who previously worked for DEC. Ahl sold *Creative Computing* to Ziff-Davis but continued to serve as editor until its final issue in December 1985.
- *NFL Challenge* generated a good deal of positive press upon its release. One reviewer, Rick Teverbaugh of *Computer Gaming World*, noted the game was "so extensive that it takes up nearly all of the 256K [of memory] available on the IBM." He also compared the Xs-and-Os display (see the example below) to John Madden's famous television chalkboard–which was prescient, given that Electronic Arts would release *John Madden Football* a little over three years later.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Chapter 7: EtherMac, Token Ring, and TOPS

IBM was not having the best year in 1985. In October, Big Blue reported its third consecutive drop in quarterly profits. *TopView*, IBM's attempt to introduce multi-tasking into DOS, had not taken the business market by storm. And then there was the ever-increasing competition from various PC clone makers.

But we're still in the period where many industry observers kept their faith in IBM's ability to brute-force its will upon the market. That leads into our next *Computer Chronicles* episode from October 1985, which focused on computer networks. As Stewart Cheifet mentioned during the last episode's "Random Access" segment, IBM had recently launched its new token ring system, which was the company's challenge to 3Com's Ethernet standard in local area networking.

Would Token Ring Become the New Standard in LANs?

Cheifet did his cold open standing outside IBM's headquarters in Endicott, New York. He quipped that when most people thought of three-letter abbreviations for "networking" it was usually "NBC", "CBS", or "PBS," but when it came to computer networks the more relevant abbreviation was "IBM." Cheifet said IBM's new token ring system could finally put computer networking on the high-tech map.

Gary Kildall was back in the co-host's chair this week. On the desk, Cheifet showed off a random assortment of computer cables. He said these were part of a computer networking system or local-area network (LAN). He noted that people in the computer industry had been talking about networking for years, but from the user's point of view nothing ever seemed to happen. Would IBM's token ring system finally make things happen in networking? Kildall said that LANs let personal computers share huge data files–and when it came to personal computers used in offices, IBM sets standards. And if there was a new standard, he saw some exciting possibilities for networking and network-aware software.

Using Existing Telephone Lines for PBX Networks

Wendy Woods presented her first report. Narrating over some B-roll footage of an unidentified office, Woods said that as PC workstations became more common–and their standalone functions more elaborate–they became increasingly attractive as alternatives to mainframe-based networks. But so far, there had been limited acceptance of LANs due to the usual incompatibility of operating systems and the expense of installing miles of coaxial cable.

But Woods said that the logic of a PC-to-PC network was powerful and there were some new solutions on the market. For businesses already equipped with a telephone PBX system, a practical network could be installed over existing phone lines. One of the first of these was Northern Telecom’s Meridian system, which worked in conjunction with a local PBX to handle both data and voice over standard twisted-pair telephone wiring.

Equipped with its logical counterpart–an integrated voice and data terminal–Woods said the Meridian system combined computer and communication functions, such as an online directory and automatic dialing. Messages could be transmitted in text or voice mode, or a combination of both. Terminals tied into the network could automatically log on to outside databases. Two users could share multimedia information simultaneously. The star-shaped network also allowed for the shared use of printers and hard disks, and the internal BUS operated at 40 MB/second.

Memory-enhanced telephones were nothing new, Woods noted, and any PC could store a directory of numbers, but the computers using the Meridian system had a practical route to travel–along the telephone wires already found in every office wall.

Ethernet on the Macintosh

Bob Metcalfe and Sherry Geddes joined Cheifet and Kildall for the first of two studio round tables and demonstrations. Metcalfe, the founder and chairman of 3Com, previously appeared on *Chronicles* back in March 1985. Kildall opened by recalling another prior *Chronicles* episode from September 1983 on LANs. He asked Metcalfe about the progress that had been made over the two years since that show aired. Metcalfe said that LANs had been a long time in coming–indeed, people like him had been working on the technology for the past 10 to 15 years. He estimated there were currently about 100,000 LANs in operation.

Kildall wondered how that figure related to the number of people who actually needed a LAN. (He quipped that the average person in the home didn't really need a LAN.) So 100,000 LANs should be considered a success. Metcalfe said it was a relative success but there was still a much bigger potential. He saw LANs as part of the next generation of computing. So in his view, 100,000 LANs seemed like a small number. There were about 7 to 8 million PCs currently used in businesses, so he thought the number of LANs could get quite a bit larger.

Kildall noted the advantage of the personal computer is that it was a standalone unit. But the disadvantage was that it didn't have access to a big database. The PC wasn't really built for I/O (input/output) processing, so is that where an LAN could help out in an office? Metcalfe said absolutely, the standalone PC was in his view a "transient" in the development of computers. That is, they were useful up to a point. So a LAN provided access to data that the PC could not store by itself, as well as data that needed to be frequently updated by many other people.

Turning to Geddes, a computer networking consultant with Strategic, Inc., Kildall asked about PBX networking, which she worked with. Could you get high data-transfer rates with a PBX system, which was basically a telephone network? Geddes said you could get high data rates on specialized PBX systems called *data PBX*. On traditional integrated voice-data PBX systems (presumably like the one Wendy Woods described in the prior segment) the data rates were still relatively low, but the throughput was very good, and that was a critical distinction. Many users didn't need a high data rate; they needed a high throughput rate because lots of users required simultaneous access to the network.

Cheifet asked Metcalfe to demonstrate EtherMac, an Ethernet adapter for the Macintosh. Metcalfe explained the Macintosh was connected to an AppleTalk server located at the other end of the studio. (A man named “Derek” monitored this machine.) Metcalfe used a floppy boot disk to login to the network and access the network server.

Kildall asked about the comparison between the data-transfer rates of the network as compared to, say, accessing a file locally from a floppy disk. Metcalfe said the network was actually two-to-three times faster than the floppy disk.

Continuing the demo, Metcalfe showed how he could open the same document that Derek was looking at on his machine at the other end of the studio. Kildall asked how users could then protect their files on the network. Metcalfe said the user could assign a password. What about simultaneous access, Kildall asked? Could two users write to the same file at the same time? Metcalfe said that 99 percent of the software designed for personal computers were meant to run on only one PC. If two PCs tried to manipulate the same data on a disk, the data itself could be damaged. So you had to take that into account when designing a network so that people did not simultaneously manipulate the same files.

Cheifet clarified that although Metcalfe’s demo involved networking two Macintosh computers, it could also be done with two IBM PCs or other computers as well. Metcalfe said yes, this particular system could network hundreds of IBM PCs or Compaqs or other machines.

Cheifet asked Geddes why people were making a big deal about the new IBM token ring standard when Ethernet already seemed to be working well. Geddes said IBM had taken a different approach. The EtherMac system was a collision-based system, which provided good access for users in an office environment. One advantage of the token ring approach was that every device knew it would get the “token” at a predetermined time. This could be very important in something like a factory, where you knew every device had to be polled every so-many nanoseconds or microseconds. In an office environment, this was useful in a bisynchronous situation or an office with a very large population where you didn't have any type of prioritization scheme. Otherwise, you might have users who never gain access to the network. Ultimately, Geddes said token ring's main benefit was to IBM customers and those shops that relied primarily on IBM equipment.

Cheifet turned back to Metcalfe and asked if EtherMac could be used to share peripherals as well as files. Metcalfe said yes, and in fact one of the strong advantages of this particular system was that you could connect multiple computers–PC and Macintosh–to an Apple Laserwriter.

Kildall asked Metcalfe about the EtherMac's system cost. Metcalfe said it cost about $10,000, not including the computers.

Multi-User Systems vs. PC-Based LANs

Wendy Woods returned with her second remote segment, this time focused on Viasyn, a company based in Hayward, California. Woods opened by noting that the difference between a multi-user system and a network was that the former was designed to be networked–unlike an office full of PCs. Viasyn was one of the players in the multi-user system market. It produced the Compupro line of CPUs and terminals.

Viasyn founder Bill Godbout–who previously appeared in another *Chronicles* remote segment reported by Robin Garthwait–told Woods there were two advantages to working with a multi-user system as opposed to a LAN composed of separate PCs. The first was speed of operation. The second was cost-performance ratio. A multi-user system like the Compupro was generally 20 to 50 percent less expensive than a network of PCs.

Woods said Compupro terminals used Datapoint Corporation's ARCNET, the networking architecture with the largest installed base in the world. This system could link up to 14 users–and even more if the CPUs were connected at central points called *nodes*. Woods noted that Viasyn's own departments were interconnected in this manner.

Unfortunately, Woods said, the biggest drawback to networking, whether through multi-user systems or a room full of PCs, was cabling. Cabling had to go through a building to every terminal hooked up to the network. There wasn't much that people in the industry could do about that. But one thing was certain, Woods said: Even IBM was planning multi-user systems that could be linked to a LAN. Meanwhile, Viasyn's multi-user business continued to grow by "several million percent," according to Godbout.

IBM Promised to Maintain "Open Architecture" with Token Ring

Stewart Cheifet presented the next remote segment, this time from IBM's offices in New York. Cheifet interviewed Richard H. Goldberg, IBM's director of marketing for the telecommunications division. Cheifet asked how token ring differed from IBM's existing PC Network technology. (That system was based on Sytek's broadband technology, as I discussed in my post on the 1983 *Chronicles* LAN episode.) Goldberg said PC Network was ideal for small departments and establishments that required a lower-cost implementation. But for businesses with an expanded set of requirements, token ring was probably a better solution–and a little more expensive.

Cheifet said that one nice feature of the token ring system was that it didn't require IBM's own expensive cabling system but could work over regular telephone lines. He asked Goldberg about the trade-offs. Goldberg said both telephone lines and the cabling system performed at 4 MB/second. But in order to achieve that performance, there were certain distance limitations, such as from the wall outlet to the wiring closet. For a twisted-pair (telephone) line it was 100 meters, while for the cabling system it was 300 meters. Goldberg added that the number of devices that could be hooked up to the network also differed. Instead of 260 devices, it was 72 devices using twisted-pair lines.

Cheifet said that IBM was following the same "open architecture" approach with the token ring network that it did with the PC. Goldberg explained that in the "real world" a network had to support a wide variety of device types–not only those that exist now but also those produced in the future. That was the value of the open architecture. It also had to foster application development.

Indeed, Cheifet noted the next challenge was to find software written to take advantage of networking. Goldberg noted that most software up to this point had been developed as a single-user activity. It didn't allow for distributed file sharing or recognizing a distributed architecture. But now they were starting to see more and more software packages, specifically databases, coming out with a true LAN implementation. In the long run, Goldberg believed that network-based software would change work habits.

Using Any PC as a File Server for Any Other PC (or Mac)

Back in the studio, Nat Goldhaber joined Cheifet, Kildall, and Sherry Geddes. Goldhaber was president of Centram Systems West, which produced *TOPS*, a LAN-based file sharing system. Kildall opened by noting that unlike the prior EtherMac demonstration–where a Mac was connected to a Mac–Goldhaber set up a demo with a Mac connected to an IBM PC-AT. (Holly Murray, a *Chronicles* producer, worked at the AT on the other side of the studio, while Goldhaber operated the Macintosh from the desk.) Goldhaber noted *TOPS* could network Macs, PCs, or any combination of the two.

Goldhaber described *TOPS* as a "distributed file-server environment." It was also an inter-operating system, meaning that any device or computer on the network–regardless of its microprocessor or operating system–could act as a file server on the network. Goldhaber demonstrated this by mounting volumes from Murray's AT to the Macintosh's operating system as if it were a native file.

Kildall clarified that you were sharing files but not applications, as the Macintosh was based on a Motorola 68000 CPU and the AT was based on an Intel 80286 CPU, which were not compatible. Goldhaber said that was correct, the server allowed for the free exchange of data only.

Goldhaber then used *TOPS* to open a *Lotus 1-2-3* spreadsheet stored on the PC-AT using the recently released *Microsoft Excel* for the Macintosh. Goldhaber noted that *Excel* was capable of both reading and writing to the *1-2-3* file format.

Recalling his earlier question to Bob Metcalfe, Kildall asked Goldhaber to compare the data transfer rate of *TOPS* to simply moving files around on a floppy disk. Goldhaber said *TOPS* was slightly faster in retrieving a file stored on a PC-AT hard disk drive.

Kildall then asked about the cost. Goldhaber said *TOPS* was a software-only product for the Macintosh, which already had a built-in networking system. The IBM PC required a separate, *TOPS*-specific card. The Macintosh software cost $100, while the PC software and card bundled together cost $300.

Kildall–worried as always about potential software piracy–then asked Goldhaber about the problem of licensing software that could potentially run across thousands of networked machines. Goldhaber said he certainly did not recommend that anyone violate the licensing agreements for their software. Indeed, many software licenses explicitly stated that a copy of a program could only be used locally on a single computer. But Goldhaber expected that all software companies would soon address the issue of so-called “site licenses,” which would legally permit multiple computers to use one copy of a program.

Finally, Cheifet asked Geddes if users should sit back and wait until the market for networking standards settled itself out before actually buying something. Geddes said no. She said the issue was so complex that if you waited, all you’d end up doing was feeling more confused later. She advised businesses to “get their feet wet” now by setting up a small-scale network and hooking up a few machines. This would let you find out if networking actually benefited your organization, and in the long run would help you make a more informed decision.

Was IBM Simply Protecting Its Mainframe Dominance?

Starting with this episode, George Morrow assumed the end-of-episode commentator role from Paul Schindler. Morrow was critical of IBM’s role in creating market confusion over networking. He noted the company had embraced “not one but three different standards” that were all incompatible with one another. And the most recent standard, token ring, was in his view the “least efficient and least reliable” of them all. He added that IBM was also largely motivated by fears that increased demand for LANs might hurt its traditional mainframe business.

The Rise of the Intelligent Factory, Intelligent Office Building, and Intelligent Home

Stewart Cheifet presented this week’s “Random Access,” featuring news headlines from late October 1985.

- Several deals were announced to develop the so-called intelligent factory where robots and computers ran the whole plant. Hewlett-Packard signed a deal with Bechtel to design and develop a fully automated electronics plant. Ford Motor Company also announced its own deal with Measurex to develop a computer-controlled system for running the automaker’s assembly plants. And General Motors said it would soon reveal its model for the “factory of the future” using its Manufacturing Automation Protocol (MAP) standard.
- The Real Estate Research Corporation said there were now 200 “smart office buildings” around the world, including the CitiCorp building in San Francisco and Hong Kong’s Exchange Square. Cheifet noted that tenants of these smart buildings received not only centralized heat, air, and phone service, but also centralized computer applications and electronic mail. The demand for such buildings was still slow, however.
- Ryan Homes of Pittsburgh claimed to be the first homebuilder in the nation offering homes that came standard with computerized controls for electrical outlets and security systems.
- Speaking of “intelligent homes,” Cheifet said the largest such structure was now in Dallas. The “FutureHome” featured $500,000 worth of

automation equipment, including 13 computers, 26 monitors, and 14 telephone terminals.
- Keeping with the main episode’s theme, Cheifet said more than a dozen companies had already jumped on the IBM token ring bandwagon and would offer bridges to the new system.
- Paul Schindler reviewed *Concepts Computerized Atlas*, which is exactly what it sounds like. Schindler noted the software’s publisher, Software Concepts, had a “clever” marketing method to generate sales. A customer could pay $5 and use the package three times. The software then froze until you paid another $50 to unlock it again. (Even then, the program was still copy protected.)
- Borland International planned to release *Turbo Lightning*, a $99 RAM-resident program that provided an AI-based spelling checker, thesaurus, and encyclopedia.
- A court clerk in Sonoma County, California, was arrested after breaking into the court’s computer system and deleting records of his arrest for drunk driving.
- Some “New Coke” machines featured two built-in computer games, including “Catch-a-Coke.” Cheifet noted you didn’t actually get a free Coke if you won, as that would be “Classic or New Gambling.” (If you want to learn more about this game, *The Video Game Soda Machine Project* by Dr. Jess Morrisette published an in-depth retrospective in 2017.)

Price and Speed Helped Ethernet Triumph Over Token Ring

Few people today have used a token ring network. That’s not to say the standard was a failure. In fact, the token ring standard was competitive with Ethernet through the mid-1990s. But Ethernet ultimately prevailed.

In a 2008 article for *TechRepublic*, John Sheesley delved into the reasons that token ring lost. He explained that strictly in terms of specs, token ring was better than Ethernet: It used bandwidth more efficiently, allowed for larger packet sizes, and performed better overall, even if Ethernet technically transmitted data at a higher rate.

Despite these advantages, Sheesley said that Ethernet speeds eventually grew so great that token ring's greater efficiency ceased to matter. Vendors also "started introducing switches which eliminated" the problems that caused Ethernet's inefficiencies to begin with.

On top of that, Sheesley said that IBM "charged too much for royalties to vendors that wanted to produce" the token ring equipment. IBM's Richard Goldberg conceded to Stewart Cheifet that token ring would be more expensive than Ethernet. But he probably undersold the cost difference. Sheesly said that at its height, a token ring networking card "could cost 5 and 6 times as much as an Ethernet card"–and that was before you factored in the cost of the cabling and switches.

Another loser in the LAN standards battle was ARCNET, which was championed by Bill Godbout's Viasyn. ARCNET was first developed by Datapoint in 1977 and was considered the preeminent networking standard in the early 1980s, but its popularity was quickly eclipsed by Ethernet and token ring. Datapoint continued developing ARCNET into the 1990s, but Viasyn, which made its mark as a provider of niche computing equipment, fizzled out. According to a November 2018 article by Iain Thomson for *The Register*, "the increasing standardization of the industry squeezed Godbout out into semi-retirement." As I noted in an earlier blog, Godbout and his family died when their town burned to the ground during the November 2018 Camp Fire in California.

Goldhaber Went from Three Mile Island to Third-Party VP Run, While TOPS Was Eventually Sherlocked

Although the Macintosh debuted with a proprietary networking standard called *AppleTalk*, it was initially designed to connect a Mac to a Laserwriter printer rather than another computer or file server. A number of third-party vendors thus stepped into fill the gap, including Centram Systems West with *TOPS*. Apple would not release its own Mac-based file server, *AppleShare*, until January 1987.

TOPS was formally released in 1986 and sold about 45,000 units during its first year on the market, according to a June 1987 *InfoWorld* report by Laurie Flynn. By that time, Centram founder Nat Goldhaber had sold the company to Sun Microsystems–which had outbid Bob Metcalfe's 3Com at the last minute, according to Flynn.

Prior to founding Centram, Goldhaber worked in politics, serving as a senior aide to Pennsylvania's Republican lieutenant governor, William Scranton III, from 1979 to 1984. At the time, Scranton was responsible for overseeing the Governor's Energy Council, and he named Goldhaber as interim director–essentially the state's energy secretary–in January 1979. Goldhaber later told Peter Delevett of the *San Jose Mercury News* that he was "unqualified" for the job beyond reading the *Whole Earth Catalog* and knowing something about windmills.

Just weeks into the job, however, Goldhaber faced two major crises: A sudden drop in oil production caused by the 1979 Iranian Revolution and the partial meltdown of a nuclear reactor at the Three Mile Island Nuclear Generating Station near Harrisburg, Pennsylvania. Goldhaber later told Delevett that he'd organized a press conference with Scranton regarding the oil crisis when he received a phone call about the Three Mile Island accident. Goldberg said it wasn't until the third day following the initial reports that the state government contemplated taking any serious action in response:

> So I was sent down to the Emergency Management Agency's bunker, three floors underground, and there I sat with a bunch of ex-military guys, mostly brass from Vietnam, and tried to figure out what an evacuation of the area would look like. About 125,000 people voluntarily evacuated, most from close to the site.
>
> It was seven or eight days before we decided things were sufficiently back to normal. There was constant talk on the national news about the situation that was grossly exaggerated, but it was the first time anybody had ever had a nuclear accident, so we really didn't know.

Having Homer Simpsoned his way out of that situation, Goldhaber left Scranton's office in 1984 and moved to California where he founded

Centram Systems West. Goldhaber initially pitched the idea of networking Macs and IBM PCs directly to Apple. According to Laurie Flynn's *InfoWorld* story, Goldhaber said Steve Jobs "thought [*TOPS*] was a product that maybe should go out with every Mac sold, maybe even as part of the ROM." But Jobs was gone from Apple by late 1985, so Goldhaber decided to market *TOPS* on his own.

After selling Centram to Sun Microsystems, Goldhaber stayed with the latter as a vice president until 1989. In 1991, Apple and IBM tapped Goldhaber to run their new joint venture, Kaleida Labs, which produced one of the earliest cross-platform multimedia players–also named Kaleida–and an associated programming language called ScriptX. Goldhaber didn't last long in the job, however, and was ousted after about a year.

In 2000, Goldhaber returned to politics, this time as the vice presidential nominee of the U.S. Natural Law Party (NLP). This is actually where Goldhaber and I likely crossed paths, as I covered the Natural Law Party (NLP) convention that year for an early political blog. The NLP was the political arm of the Transcendental Meditation (TM) movement founded by Maharishi Mahesh Yogi, an Indian-born yoga guru. Goldhaber studied with the Maharishi and helped him establish the Maharishi University of Management (MUM) in 1973 to promote TM as part of a "consciousness-based" educational program.

Dr. John Hagelin, a physicist, joined MUM–now called Maharishi International University–in 1984 and currently serves as its president. Hagelin co-founded the NLP in 1992 to promote governance based on TM principles. He was also the party's presidential nominee in 1992, 1996, and 2000. Mike Tompkins, another physicist, was Hagelin's running mate in the first two elections. Goldhaber took over the number-two slot in 2000. As I noted in my blog post at the time, "Goldhaber has promised to provide Hagelin with financial support and the use of two planes."

The Hagelin-Goldhaber ticket only appeared on 38 state ballots, winning a total of 83,714 votes nationally. This proved to be the NLP's last stand. The party dissolved in April 2004. Goldhaber hasn't been a political candidate since and instead is living the venture capitalist lifestyle in San Antonio.

As for Centram Systems West, Sun renamed the company TOPS shortly after the acquisition. *TOPS* the product continued to do well up until Apple released Macintosh System 7 in 1991, which finally included its own built-in file server. This effectively eliminated the market for *TOPS*. (The common practice of Apple assimilating third-party features into its core OS would later be called "Sherlocking".) Sun tried to cut its losses by spinning off TOPS into a separate company, Sitka Corporation, but when it couldn't find a buyer, Sun shut down the former TOPS entirely in 1993.

Notes from the Random Access File

- This episode is available at the Internet Archive and has an original broadcast date of October 24, 1985.
- Sherry Geddes had a long career in marketing within the tech industry. In the early 1980s, she worked at Sytek, a company featured in the 1983 *Chronicles* episode on local area networks. In 1989, Geddes joined First Pacific Networks as its vice president for marketing. She took a similar role with Tezzaron Semiconductor in 1999. Geddes is currently retired and living in California.
- Viasyn's Bill Godbout had a long professional association with George Morrow, which Herb Johnson detailed in a 2018 post following Godbout's death.
- This wasn't made clear in the episode, but EtherMac was not made by Bob Metcalfe's 3Com. Rather, EtherMac was the first in a long line of Macintosh networking products made by Farallon Computing, Inc., during the 1980s and 1990s. In 1997, Farallon changed its name to Netopia, Inc.. A year later, Netopia spun-off its Macintosh products business into a separate company, this time called Farallon Communications. Proxim Corporation–now known as Proxim Wireless–acquired Farallon Communications in 2000 and then bought Netopia in 2001.
- The Dallas FutureHome was the brainchild of Portia Isaacson Bass, a computer scientist. The *Los Angeles Times* noted in a September 1985 profile that Isaacson and her husband financed their computerized dream home with the $8 million sale of her company, Future Computing, Inc., to McGraw-Hill in 1984. The FutureHome was briefly featured in the 1987 movie *RoboCop* (which was filmed in

Dallas). The house has been sold several times since 1985, with the most recent sale occurring sometime around 2019 for around $1.6 million.

Chapter 8: Solon, Bob Carr, Ed Zschau, and F-15 Strike Eagle

Many *Computer Chronicles* episodes to this point have discussed, or at least mentioned, the influence of politics on the tech industry. But this next episode from November 1985 looks at how the computers were influencing politics. And our hosts were not necessarily encouraged by what they saw.

Would the "Information Age" Lead to a "1984-ish" Scenario?

Stewart Cheifet did his cold open from the United States Capitol building in Washington, DC. He said the federal government cranked out millions of pieces of paper per day. You couldn't find a better prospect for the "paperless office" and computers. He added that computers were not only being used in government, but also in campaigning.

In the studio, Cheifet showed Gary Kildall the *Washington Alert Service*, an online database operated by Congressional Quarterly, Inc., which cost about $100 per hour to access. Cheifet said the service offered an incredible amount of information about what was happening in Washington. For example, you could see the exact schedules for the House and Senate or any of their committees, check on the status of a particular bill, or look at the voting records of members and their constituents.

Cheifet said this service was a good example of how computers were being used to handle the massive data management problems involved in the political process. But weren't there also concerns that computers could be used in a dangerous kind of "1984-ish" way to threaten the political process? Kildall replied this was a clear example of how we were moving into the "information age," i.e., where information was a valuable commodity. If you had quick-and-ready access to this information, you had a tremendous competitive advantage.

Kildall cautioned that if there was value in having this kind of background information about a politician, then you could only imagine the value of having everyone's own personal records accessible. So how did we keep that from happening? Cheifet agreed that was a problem.

California Legislature Adopted Computerized Data Management

Wendy Woods presented her first remote segment, reporting from the California State Capitol in Sacramento, where she narrated some B-roll footage of legislative staffers using computer systems. She said that "politics as usual" was giving way to "automation as usual." At almost every level of legislative life, computers had arrived.

In an effort to trim the 500 million pages generated by the California legislature each year, Woods said the Capitol's data center had established a network of mainframes and personal computers to provide instant access to legislative activities. Unique bill-tracking software allowed representatives to watch the progress of legislation through the Assembly, the Senate, and their myriad of committees. The system displayed proposed amendments in the same way as a traditional paper document–but with the advantage of highlighting the amended text in color.

As members became accustomed to their new machines, Woods said, they found their own applications. In one unidentified legislator's office, letters from constituents were coded and then matched by topic to the bill-tracking database. When a controversial bill approached the crucial vote, warning letters were quickly dispatched to those interested voters.

While some critics said a database of "choice" voters might seem like an open invitation for campaign activities, Woods said legislators were eager to point out their genuine need for the system. On average, each office holder had 8,000 bills to watch over and several hundred thousand constituents–each one with an opinion to express.

Political Hacks Used Computer Algorithms to Target Voters Even Back in 1985

Two political campaign consultants, Roger Lee and Frank Tobe, joined Cheifet and Kildall for the episode's first round table. Kildall asked Lee for a general overview of how computers were being used in political campaigns. Lee said the main goal was to target voters for candidates. His company, Capital Data Communications, built databases using registered voter files. It then matched that data to other files to gather additional information such as the voter's occupation, age, ethnicity, how often they voted, and so forth.

Kildall asked Tobe if that was also what his firm–Below, Tobe & Associates–did as well. Tobe said that developing a database was just the beginning. You then gave that database to a campaign strategist so they could see the different segments that made up the candidate's district. The strategist then spent campaign funds to try and develop these segments into people who wanted to vote for their candidate. This required the use of pollsters and other direct contract methods. Once you identified a segment, you started using different types of products to get the campaign's message across.

Cheifet said this sounded like an "inverse if not perverse" process where you go out and find what the constituent wanted and that's what the candidate would become. Tobe said that wasn't exactly what happened. The goal was to find out the components that made up the candidate's district, and then you determined how the candidate could address each of those different segments. For example, if you had a "highly ethnic" district, then it was incumbent on the candidate to have something unique to say to those ethnic groups. And that may not be the same thing that a "non-ethnic working guy" would pay attention to. So you had to identify these people just to get their attention.

(I will break the recap at this point to note that Frank Tobe was a Democratic Party political consultant. His firm took in about $5 million during the 1986 election cycle, according to the *New York Times*. Tobe also bragged to the *Times* that he had a "gay algorithm" that was "used to locate people who are likely to be homosexual, and thus interested in a politician's stance on gay rights.")

Kildall next asked Lee to demonstrate *Solon*, a software product for IBM PCs that many small campaigns used. The software had different components. One section was for incumbent officeholders and allowed them to track casework–i.e., letters or calls received by the office on a specific topic. Another section focused on campaign administration, such as the candidate's scheduling, recording contributions, setting up polling questionnaires, performing district analyses, and so forth.

Using an IBM PC, Lee demonstrated the political office casework management segment of *Solon*. He said this system was currently installed in every office of the New York State Assembly. Lee pulled up a sample constituent file. The file contained the constituent's basic contact information, whether they'd written the office before, his job, date of birth, Social Security number, ethnicity, et cetera. Cheifet asked where all this information came from. Lee said it often came from information provided by the constituent. In the case of voters, they relied on a variety of sources, such as DMV records or tax assessor lists (to see who owned property).

Kildall asked about the privacy implications of these types of databases. Lee said that all of their lists were based on publicly available information. He said the goal was to match their client's message to the recipients. But they weren't "prying" or using any information that wasn't already public or otherwise secret.

Cheifet asked Tobe how important this stuff was. Was it possible that Candidate A beat Candidate B because they had better software? Tobe said there were some studies that suggested campaign tactics accounted for about 2 or 3 percentage points in an election. Most candidates won by 5 percent of the vote. So for 50 percent of campaigns, the computers didn't have much of an effect. But for the other 50 percent it had "one heck of an effect." So if you had products that could help you identify that "extra group of people" who will pay attention to your message, then the software could have an actual effect. Kildall noted Tobe's firm maintained a nationwide database. Tobe said it had information on about 90 million voters, mostly Democrats.

Did Computers Lead to More Accurate Polling?

Wendy Woods returned with her second remote report, this time from Field Research Corporation, a San Francisco-based political polling firm. She said that as politicians became increasingly dependent on polls, the pollsters had become increasingly dependent on computers. For example, Field Research relied on a network of terminals connected to a Digital Equipment Corporation VAX 11/750 minicomputer. The system drew random phone numbers for operators to call and allowed interviewers to read questions right off their terminal display. The recipients' answers were fed directly into the minicomputer, where analysts could then look at the data in a number of ways to compile their reports.

Field Research's tabulation manager, Rick Felsing, told Woods that computers allowed them to turn things around much faster. Now when they received the data it was a matter of 2 or 3 days to generate reports. Before, it took about a week to 10 days. In fact, now they could turn around a study the moment the interviewing was complete.

Woods said that over the last few years, computers had virtually taken over the research field. But one job that computers would not be taking over soon was the role of the interviewer. Human operators still beat out the sympathized voice.

Woods added that the biggest advantage of the computer was that it produced more accurate results. Field Research's polls, for instance, claimed just a 3.1-percent of margin of error in predicting general election outcomes.

House Members Embraced Computers While Warning About Going "Too Far"

Stewart Cheifet was back at the U.S. Capitol to interview two members of the House of Representatives who made extensive use of computers in their campaigns and congressional offices. The first subject was M. Robert (Bob) Carr, a Democratic congressman from Michigan. Cheifet noted that Carr's office featured 4 typewriters, 7 people, and 10 computers. Carr was one of only three House members with his own computer system, which was based on IBM PCs and an Ethernet network.

Carr told Cheifet that computers had revolutionized his office. He said there were no secretaries in his office as such. All new hires were required to have some computer friendliness, and even better if they had computer training. Each staff member was therefore required to know how to type and expected to type their own letters. Nobody in his office asked someone else to do essentially their job for them.

Cheifet said Carr not only used computers to operate his office in Washington, but also to get elected back in Michigan. Carr thought that better computer systems did make a difference. He told Cheifet that he'd tried to put into his organization people who were "computer smart" and when it came to the campaign they'd run circles around the opposition.

On the other side of the aisle, Republican Rep. Ed Zschau represented a California district that included Silicon Valley. Cheifet said you'd figure that Zschau would use computers. And he did–particularly to handle mailings to voters. While some people complained about computerized letters, Zschau said it all made sense. He told Cheifet that in a campaign, the goal was to get your message to the voters. Some messages made no difference to certain voters, so you were wasting your time, energy, and money. But another message to those same voters could be very influential in their decision-making. So the use of computers to target the messages was perfectly appropriate.

Cheifet said Zschau told him that he could see the day when a computer would actually design a political campaign. Zschau said computer models of how to win a campaign based on polling and historic data could develop strategy and themes that would appeal to enough voters to get you a majority.

But both congressmen warned Cheifet about the dangers of going "too far" with computers in politics. Carr said you always had to keep the technology in its appropriate place. Computers could help you assimilate and cross-tabulate vast amounts of data on what people were thinking. But you still could not computerize the "human element."

Who Would Protect Voter Data from Misuse?

For the final segment, Gary Chapman joined Cheifet, Kildall, and the returning Frank Tobe. Chapman was the executive director of Computer Professionals for Social Responsibility (CPSR).

Kildall opened by asking Tobe to show an example of how he used his database system in running campaigns. Tobe showed off what appeared to be an envelope addressed by hand. In fact, it was a mass produced political mailing for an Arizona campaign. Tobe said that pollsters found that senior citizens would have the most impact on this particular campaign, which involved a ballot initiative on health care. Yet seniors were paying the least attention. So the campaigner decided to design the faux-handwritten letter and distribute 175,000 of them to senior citizens identified by Tobe's database. Tobe said there were about 1,500 variations of this "totally personalized" letter.

Kildall asked if this particular campaign was successful. Tobe said yes. He added that about 20 different names were used to "write" the letters. These people, in turn, received about 14,000 telephone calls, Tobe claimed, even though the "senders'" numbers were never disclosed.

Kildall then turned to Chapman, whose group focused on ethical issues in computing, and asked for his feelings on someone like Tobe keeping a comprehensive database on 90 million people. Chapman said he didn't want to "malign" Tobe or his work, but as a social question this was something that required a public debate. The idea of targeting particular constituencies to address a single issue of concern to them was "somewhat disturbing." He thought computers had played a role in the rise of "one-issue politics," where people were voted into office based on a single issue, which he saw as a bad trend.

Kildall asked about the sources of information, such as DMV records, which people might consider private. Chapman said there was quite a bit of confusion regarding public-versus-non-public information. Some information, such as tax records, should be public. But other information, like data in a DMV file, should not necessarily be public. What disturbed Chapman and CPSR were situations where information was gathered from a person for one purpose that they agreed to but then used for another purpose that they did not consent to.

Kildall asked Tobe how his company dealt with these issues. Tobe agreed that it was a serious problem. In his own example of a campaign targeting senior citizens, a campaign could misuse that data. He noted that DMV data was publicly available in Arizona, so they could match registered voters to their date of birth to determine if they were senior citizens. But he suggested that it would be improper to, say, target different groups of voters with contradictory messages.

Kildall added that someone could also misuse these databases to solicit contributions for a fund that didn't even exist. Tobe said there were rules against that. For example, voter files could only be used for campaign or governmental purposes. They could not be used to sell insurance or some other commercial purpose. That's why his own firm only handled political clients.

Kildall pushed back, noting the list still had commercial value and could be stolen. Tobe insisted they had "very serious security" to guard against theft. But Kildall pointed out, and Tobe conceded, there was no "formal mechanism" in place to protect such data.

Cheifet shifted to the subject of using computers to actually tally election results. He noted there were concerns about centralizing the tampering point for ballots. Did that concern Chapman as well? It did, he replied, adding there were currently several pending court cases concerning computer voting. These cases involved a particular computer program alleged to be especially prone to manipulation. The program used data punch cards, which could be added to a stack of legitimate votes or replaced with other cards that changed the software code used for tabulation.

Defending Yourself Against Political Manipulation

I’m just going to print George Morrow’s closing commentary verbatim, as it offered a prophetic warning:

> You know, paper made it easy to record information. The printing press made it easy to duplicate information. And the computer makes it easy to manipulate information.
>
> Politics is the art and science of manipulation–manipulating people and events. So you can expect that the computer and the politician are going to go hand and glove. Now, lobbyists have manipulated legislators for a long time, and the politicians are now going to use this computer as a device to try and manipulate you, to make you think that things are something that they aren’t.
>
> Having a leg up on it is your best defense. And nobody ever told us or promised us that a democracy was going to be easy to run. But a well-informed population, a well-informed electorate, is the best device to keep it running well. Knowing what these computers can–and will–do is your best defense.

Hackers Took Down Congressman’s Office, HBO Satellite

The Internet Archive’s record of this episode is actually a rerun from May 1986, so that’s when this “Random Access” segment by Stewart Cheifet was made.

- The Spring COMDEX show in Atlanta recently concluded. Cheifet said there was no major news to report. IBM had the biggest presence at the show, while Apple and Microsoft were no-shows.
- Despite a flurry of media reports, there was no deal between Steve Wozniak and Nolan Bushnell to merge their respective companies, CL9 and Axlon Inc.
- Rep. Ed Zschau’s office computer system, a subject of the main program, was hacked in late April 1986. Zschau’s entire database was erased. Cheifet said this was believed to be the first computer break-in on Capitol Hill.

- Speaking of Congress and computer crimes, a House subcommittee held a hearing on a bill introduced by Rep. William J. Hughes, a New Jersey Democrat, that would make it a felony to maliciously cause damage to a computer program or database. (An amended version of the bill was signed into law that October as the Computer Fraud and Abuse Act of 1986.)
- A hacker identified as "Captain Midnight" broke into HBO's satellite feed. According to investigators with the Federal Communications Commission, the hacker's transmitter dish was likely somewhere in Texas.
- Paul Schindler reviewed *Paradox* (Ansa Software, $695), a relational database management program that resembled *dBASE III* but did not involve learning a complex programming language. Schindler noted the program required at least 512 KB of RAM and a hard disk was a "practical necessity."
- Zenith announced price cuts on its personal computers. The price of the Zenith Z-158 was reduced $300 to $1,999, and the price AT-compatible Z-200 with a hard drive would be cut up to $1,000.
- GRiD Systems won a contract to supply the United States Postal Service with up to 3,000 portable computers at a cost of $8 million.
- IBM and AT&T made their first presentations at an annual conference dedicated to computer speech recognition technology in New York City. Cheifet noted that sales of voice-related products topped $100 million in 1985.
- The American Electronics Association wanted to do something about the shortage of teachers in the computer field. Cheifet said the Association had set up a new scholarship fund to provide up to $76,000 for a Ph.D student if they agreed to teach for three years after graduation.

MicroProse Profited from "Relatively Light" Civilian Casualties in 1986 Libya Bombing

There was one final "Random Access" item, which I decided to move into my discussion of the episode since there's an interesting backstory that also plays into the overall theme of computers and politics. Once again, I'll reprint Stewart Cheifet's report verbatim:

> Finally, a piece of game software zoomed up the charts last week, moving from 15th to 5th on the bestseller list in just one week. It's called *F-15 Strike Eagle*. It's a flight simulator that lets you pilot an F-15 attack bomber. Among the pre-programmed targets is a terrorist camp in Libya.

At first glance, and without knowing the context, this seems like a strange item. Why talk about a game that's No. 5 on the charts? And why mention Libya?

First, let's establish what chart we're talking about. *Billboard* magazine published bestseller charts for software during this time. I looked up the chart for the week of April 26, 1986, and just as Cheifet reported, *F-15 Strike Eagle* had jumped from the 15th to 5th position since the prior week. In and of itself, however, that was hardly notable. In fact, the publisher of *Strike Eagle*, MicroProse, actually had a higher-ranked game on the chart, *Silent Service*, which had risen from No. 7 to No. 3. (In case you're wondering, the No. 1 game was Origin Systems' *Ultima IV: Quest of the Avatar*.)

Strike Eagle was already a well-established game by April 1986. The original release, developed by MicroProse co-founder Sid Meier for the Atari 8-bit computer line, came out in 1984. By April 1986, MicroProse had ported *Strike Eagle* to the Apple II, Commodore 64, and IBM PC, and the game had been on the *Billboard* chart for 60 weeks. So again, why did its sales ranking suddenly jump during this particular week in April? As Cheifet hinted, the answer was Libya.

More precisely, it was that two weeks earlier, on April 15, 1986, the United States armed forces conducted Operation El Dorado Canyon, a series of air strikes against targets in Libya. This operation was in turn retaliation for the bombing of a disco in West Germany on April 5 that killed three people and was blamed on the Libyan government headed by Colonel Muammar Gaddafi. At least 60 more people, almost all Libyans, died during the U.S. attack.

MicroProse–whose president and other co-founder, John “Wild Bill” Stealey, was himself a former Air Force pilot–decided to capitalize on this crisis. Now, this was long before the days of downloadable updates for computer games. So instead MicroProse issued a revised *Strike Force* manual in July 1986 that instructed the player on how to recreate the April 1986 “anti-terrorist airstrike” using existing scenarios from the game, including a mission based on a previous military encounter between the United States and Libya from 1981 known as the Gulf of Sidra incident. The manual update also helpfully explained how American technological superiority kept civilian casualties in the 1986 Libya bombing “relatively light.” (Civilian casualties were estimated between 15 and 30 people.)

To further Stealey’s war profiteering strategy, Wendy Woods reported for her own *Newsbytes News Service* on April 29, 1986, that MicroProse “spent $20,000 on a *New York Times* ad last Sunday, asking, ‘The World in Conflict…What Would You Do?’” Of course, MicroProse was hardly alone in marketing American militarism towards Libya during this time period. Just a couple of weeks later, on May 12, 1986, Paramount released *Top Gun*, a movie that featured a fictionalized air battle involving F-14 Tomcats that was likely inspired by the 1981 Gulf of Sidra incident.

Carr’s Anti-Vietnam Activism Helped Fuel Two-Decade House Tenure

American military policy also played an important role in the political careers of the two congressmen featured in this episode, Bob Carr and Ed Zschau. In Carr’s case, he was first elected to the House from Michigan’s 6th congressional district in 1974 as a staunch opponent of the Vietnam War. During his first term, Carr led an effort to end all remaining U.S. military assistance to South Vietnam and Cambodia. Carr also took a significant interest in nuclear disarmament issues, serving as an observer at the 1979 SALT II talks between President Jimmy Carter and Soviet leader Leonid Brezhnev and later making numerous inspection visits to Soviet nuclear sites.

Carr lost his third House re-election campaign in 1980 but regained the 6th district seat in 1982. During Carr’s second House tenure he served on the appropriations committee and largely focused on promoting spending on transportation projects. Carr remained in the House until 1995.

In 1994, Carr won the Democratic nomination for Michigan's open Senate seat. Unfortunately, that was the year the Republicans gained a net total of 10 seats in the Senate. Carr lost his race to Republican Spencer Abraham, making him the only Democrat to lose a Michigan Senate election between 1978 and 2020.

Following his 1994 defeat, Carr resumed his pre-congressional career as a lawyer. In 2012, he joined George Washington University's Graduate School of Political Management as an adjunct professor. Since 2013, he's also been an executive in residence with Brookings Executive Education and a senior advisor with Transnational Strategy Group, LLC.

Zschau "Dodged a Bullet" with Close 1986 Senate Loss

The other congressman from this episode, California Republican Ed Zschau, also saw his House career end with an unsuccessful Senate campaign. Zschau didn't spend as much time in politics as Carr. As you might expect from a man who once represented Silicon Valley, Zschau made his name (and fortune) in the tech industry before briefly diverting into politics.

Zschau actually started out wanting to join the Navy. After graduating from Princeton in 1961, he was accepted to the U.S. Navy Officers Candidate School in Rhode Island. But he failed the Navy's medical exam due to a rugby injury. Zschau told podcaster Tim Feriss in 2019 that with the Navy no longer an option, he decided to get his MBA from Stanford instead. He'd go on to earn his MBA and a Ph.D at Stanford. During that time, Zschau embarked on his first career in teaching.

In 1968, Zschau founded System Industries Inc., which initially focused on providing third-party peripherals for DEC minicomputers. The company would later become known primarily for its disk drive business. Zschau served as CEO until 1981 and took the company public in 1980. System Industries remained in business until 1993, when it filed for bankruptcy.

Zschau said he was prompted to become involved in politics while serving on the board of the American Electronics Association, an industry lobbying group (and also the subject of another "Random Access" item from this episode). In 1977, Zschau led the Association's campaign to reduce the federal capital gains tax. Those efforts bore fruit the following year when Congress cut the top capital gains tax rate from 50 to 28 percent.

Building off of that success, Zschau decided to run for Congress in 1982, winning the open 12th congressional district in California. Zschau said he never planned to serve more than three terms in Congress. He'd only end up serving two. In 1986, he decided to run for the Senate.

Although Zschau was not considered an especially high-profile congressman, he managed to spend $3.4 million and defeat a dozen rivals for the Republican nomination with just over 37 percent of the primary vote. Zschau then faced three-term incumbent Democratic incumbent Alan Cranston in the general election.

Zschau positioned himself as a libertarian-leaning Republican. But his changing views on military and foreign policy emerged as a focal point during the general election. As the *Los Angeles Times* reported in September 1986, Zschau pledged during his first run for Congress to oppose a costly new missile program. He then voted in favor of the program under pressure from the Reagan administration, only to switch sides again the next year.

The *Times* also cited Zschau's "controversial change of heart about Arab arms sales." Zschau served on the House Foreign Affairs subcommittee for the Middle East–a position he sought largely to champion loosening export restrictions on U.S.-made computer equipment. He'd also supported the White House's policy of selling arms to Saudi Arabia. But after a visit to Israel, the *Times* said "he hesitated and finally said he wouldn't vote for such a sale again."

Cranston, a staunch supporter of Israel, pounced on this change of heart to paint Zschau as unprincipled. It also led to a rather unusual criminal case. One of the minor candidates on the general election ballot was Edward Vallen, the nominee of the right-wing American Independent Party. A

Cranston supporter named Michael Goland, who was also pro-Israel, decided to try and divert Republican votes away from Zschau by secretly funding a series of commercials for the Vallen campaign. But the ads never disclosed Goland's role–they purported to come directly from the Vallen campaign–and when federal prosecutors got wind, they charged him with violating campaign finance laws. After the first trial ended in a mistrial, a second jury convicted Goland.

Did Goland's efforts make a difference? Perhaps. Zschau ended up losing to Cranston by a margin of 104,868 votes. Vallen received 109,916 votes. But Zschau apparently didn't harbor any animosity over the loss. He later told Tim Ferriss that he'd "dodged a bullet," as he ultimately ended up having a much greater impact on people's lives as a venture capitalist with the firm Brentwood Associates than he would have had as a senator.

In addition to venture capital work, Zschau also had a stint as an IBM vice president in the mid-1990s, overseeing its systems storage division. During the 2000s he returned to his academic roots, serving as a visiting lecturer at CalTech and his alma mater of Princeton. In 2019, Zschau volunteered to serve as the interim president of Sierra Nevada College near Reno. During his tenure, which ended in August 2020, the school changed its name to Sierra Nevada University.

One final note: Zschau did briefly reappear in politics during the 1996 presidential election. Former Colorado governor Richard Lamm announced his candidacy to seek the nomination of the Reform Party that year, challenging the party's founder, former IBM salesman H. Ross Perot. Zschau agreed to serve as Lamm's vice-presidential running mate. Zschau later told the student newspaper at Sierra Nevada College that the campaign only lasted a couple of weeks and that it "was just a favor to Dick Lamm that I would accompany him to some television interviews." Perot won the nomination easily in a national primary vote and selected economist Ed Choate as his running mate.

Frankly, I wouldn't have even mentioned this footnote in Zschau's biography if it hadn't led to one of the stupidest coincidences in "Chronicles" history. In the last episode, I discussed how one of the guests, Nat Goldhaber, had been the 2000 vice presidential nominee of the Natural

Law Party. What I neglected to mention then was that like Zschau, Goldhaber was also an unsuccessful candidate for the Reform Party's vice-presidential nomination. During the 2000 campaign, Goldhaber and presidential running mate John Hagelin unsuccessfully tried to "double dip" and win the Reform Party nominations as well. They ended up losing after a bitterly contested convention to white Christian nationalist leader Patrick Buchanan and writer Ezola Foster.

Notes from the Random Access File

- This episode is available at the Internet Archive and had an original broadcast date of November 5, 1985, although as previously noted the episode I reviewed was a rerun that aired on May 2, 1986.
- Gary Chapman (1952 - 2010) was working towards his Ph.D in political science at Stanford University when he left the program in 1984 to join the recently formed Computer Professionals for Social Responsibility (CPSR). Chapman, a former medic with the U.S. Army's Green Berets, also taught at the University of Texas, Austin and founded that school's 21st Century Project. Chapman died in December 2010 while on a kayaking trip in Guatemala, according to the *New York Times*. CPSR itself dissolved in 2013 after naming Chapman the final (posthumous) recipient of its Norbert Wiener Award for Social and Professional Responsibility.
- Roger Lee continues to work as a political strategist and campaign manager based in Washington, DC.
- Frank Tobe spent 28 years as a political consultant. In 2008, he pivoted to robotics, establishing *The Robot Report*, a database and tracking index for that industry. Tobe sold the *Report* to WTWH Media LLC in 2018. Since then, he's run his own research firm, FLT Consulting.
- Rick Felsing remained with Field Research Corporation until 1990. He was most recently employed by Cooper Roberts Research.
- *Solon*, the product demonstrated by Roger Lee, was sold by Q Systems Research Corporation of New Jersey at a list price of $16,500. But that wasn't for just the software. According to a March 1984 review in *PC Magazine*, the customer actually received $14,000 worth of hardware, including a IBM PC XT, a Hayes modem, and a printer.

- The “customized” letter that Frank Tobe displayed during the final segment was for a campaign opposing a 1984 Arizona ballot initiative, Proposition 200, which would have created a state healthcare authority. (The initiative failed.) As Tobe mentioned, a number of names were used as “senders” for these letters. The letter he showed used the name “Mrs. Wesley Bollin,” i.e., Marion Wallinder. She was the widow of Wesley Bollin, Arizona’s longtime secretary of state who briefly served as governor from October 1977 until his death in March 1978. Bollin was filling the unexpired term of former Gov. Raul Castro, who resigned to accept an ambassadorship.
- “Captain Midnight” was John R. MacDougall, who was actually based in Florida and not Texas. The U.S. Department of Justice described MacDougall as “a disgruntled satellite dish dealer” who wanted to demonstrate “the vulnerability of the satellite communications network to intentional interference by disrupting a cable television transmission to viewers east of the Mississippi.” Federal prosecutors charged MacDougall with illegally operating a satellite uplink transmitter and he received a $5,000 fine and one year of probation.
- *Paradox* and *dBASE III* were eventually both acquired by Borland International. Corel Corporation later acquired the rights to *Paradox* from Borland and continued to publish updated versions as part of its *WordPerfect Office* suite until 2009.

Chapter 9: The Cemax-1000, Poisindex, PUFF, and the EXPERT System

This episode of *Computer Chronicles* from November 1985 returned to a favorite topic of the show: artificial intelligence and expert systems. Here, the focus was on the practical applications of such technology to the field of medicine. Essentially, how could computers be used to improve the delivery of health care?

From Artificial Hearts to a "Doctor in a Box"?

To kick things off, Stewart Cheifet presented his cold open from Penn State's Milton S. Hershey Medical Center in Hershey, Pennsylvania. He held the Penn State Heart, a mechanical artificial heart that had recently been used to keep a man named Anthony Mendia alive for 10 days. But that was nothing compared to another prototype that Cheifet displayed, a new artificial heart with a microprocessor inside that could control all of the device's functions. Cheifet said this device would be ready for human use in about five years and was just one example of how computer technology could be used in medical research.

Back in the San Mateo studio, Cheifet showed off a Drexon Lasercard to Gary Kildall. (This was the second time Cheifet had used this prop; it previously made an appearance back in a May 1984 episode on storage devices.) It looked like a credit card but actually contained 800 pages of medical information, including X-rays, EKGs, and a patient's complete medical and pharmaceutical history. Cheifet noted this wasn't something out of "Star Trek," but something being used right now by Blue Cross in Maryland. He said it was a good example of how computer technology was being used in the medical field.

Kildall noted that medicine, like law, was very information-intensive and something like the Drexon Lasercard could help manage that information. But computers had a wide variety of potential uses in medicine. Someday, he quipped, artificial intelligence and expert systems could lead to a "doctor in a box."

Using Computer Graphics to Perfect Plastic Surgery

In her first remote segment, Wendy Woods reported on the work of Contour Medical Systems, a California company that used computer graphics to design replacement parts for the human body. Woods noted the most common tasks given to computers were time-consuming or tedious jobs that humans didn't like to do. But in the medical field, computers were more than time-savers.

Woods said that Contour's imaging processing computer–known as the Cemax-1000–was capable of reconstructing the shape of damaged body parts to enable "nearly flawless" repairs. Working from X-ray slices taken by a computerized tomography scanner, the Cemax could create three-dimensional images of bone structure or soft tissue. For many kinds of surgery, Woods noted, it represented a major departure in method.

Dr. David N. White, a plastic surgeon and co-founder of Contour, told Woods this work began when he was a junior resident at Stanford and saw the means by which facial reconstruction surgery was performed. You would essentially take a planar projection X-ray that would have multiple overlying shadows and try to make a diagnosis on that basis. Once you did that, White said, you would go to the operating room, open the patient, and try to reconstruct what you thought was there. But often, the surgeons found that their diagnosis in the operating room was different then what they had initially thought. The doctors would then have to take a piece of bone from elsewhere in the patient's body and carve it to match the part needed for the reconstruction.

White said this process was more art than science, so by using the computer in this way, his goal was to make the process a more well-defined scientific exercise. Woods explained the Cemax system began by highlighting selected areas of the scanned image, picking out the boundaries of different tissue densities. Each area could then be examined to assess the kind of surgery required.

In the case of damage to one side of the face, Woods said, Cemax would first create a mirror image of the intact side and then fill in the missing parts for perfect symmetry. The software provided a neat, mathematical solution to an aesthetic problem–with some limitations. White said that computers would not replace surgeons and what one could deliver in the operating room was affected by things other than mathematics and cybernetics.

To complete the process, Woods said, once the program had designed a screen model of the missing facial part, a software-driven milling device created a plastic mold. This yielded a precise model of the final synthetic or bone-graft replacement.

White told Woods that he expected there would be a “computer explosion in medicine” over the next few decades and this was the beginning of an exciting era where the computer and physician would be inextricably linked.

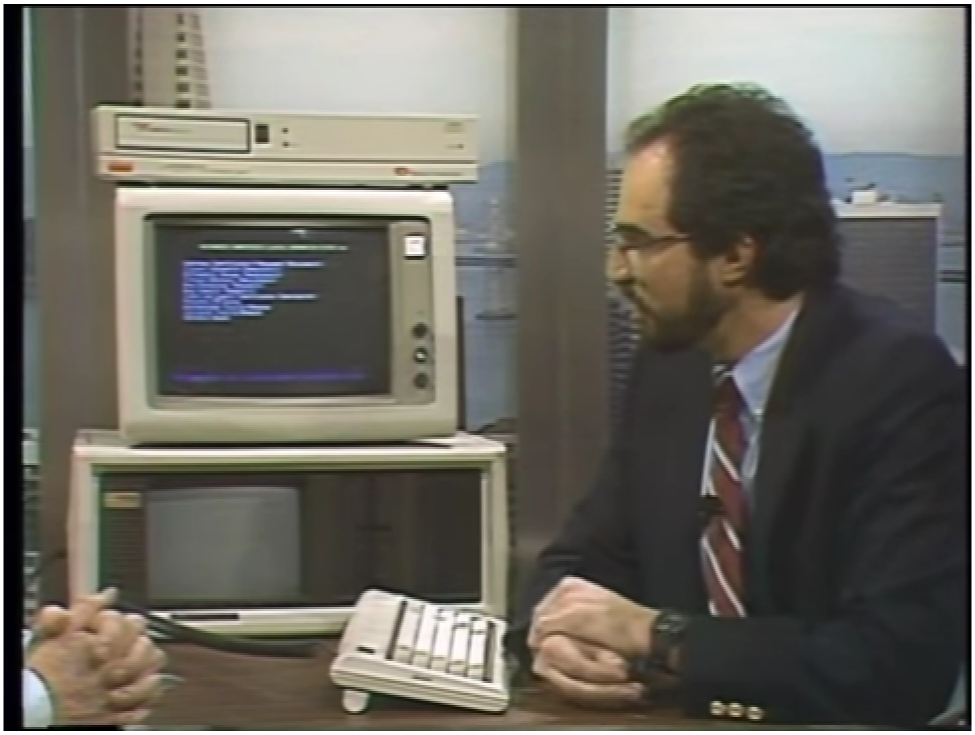
Moving Doctors from Textbooks and Microfilm to CD-ROM

The first round table segment for this episode featured Mark Tuttle of the University of California, Berkeley, and Dr. Ben Honigman of the University of Colorado Medical Center. Kildall asked Tuttle, a specialist in the use of medical technology, about the overall effectiveness of computers in medicine. Tuttle replied that in some areas computers had been “extremely effective,” and in other areas “not effective at all.” He noted that whenever a patient walked into a doctor’s office or emergency room, almost anything could be relevant to their medical problem. So at that point, computers were not terribly useful because they couldn’t be programmed to measure “relevance.” On the other hand, as the patient’s problem became more narrowly defined–i.e., eliminating the 99.9 percent of things that were not relevant–you got into more specialized knowledge, and at that point computers had been successfully applied in a number of contexts.

So the problem was in making the initial diagnosis, Kildall asked? Tuttle said yes, again because of the problem of determining relevance.

Kildall then asked Honigman, the director of the University of Colorado hospital's emergency room, to demonstrate *Poisindex*, a CD-ROM database used by doctors to help diagnose toxicology cases. Honigman said the database also contained information about a number of different areas, including drug and clinical information. Honigman said *Poisindex* was used not just in the ER but also by critical care and intensive care doctors.

Honigman used the software–running on a Compaq Portable hooked up to a CD-ROM (see image below)–to illustrate a sample toxicology case. In this example, a child was found next to a bottle of aspirin. *Poisindex* contained information about aspirin from different manufacturers and what each of their respective pills contained. Kildall clarified that *Poisindex* was a purely local database that did not require online access. Honigman said yes, everything was stored on 250 MB CD-ROM discs.



> Dr. Benjamin Honigman of the University of Colorado seated at a desk. On the desk there is a Compaq Portable PC with an external monitor atop the computer. On top of the monitor there is a large CD-ROM player. There is some illegible text displayed on the external monitor.

Honigman continued his hypothetical example, showing how *Poisindex* could provide information regarding the proper treatment for the patient. Tuttle interjected, asking whether a doctor wouldn't already know the treatment for something like aspirin toxicity. Honigman said there were some idiosyncrasies about the treatment in terms of severity. A mild toxicity case called for different kinds of therapy that severe toxicity. By inputting laboratory blood test results, the software could assess that severity, he added.

Kildall asked how doctors would have found this type of information before something like *Poisindex*. Honigman said you'd need to manually search textbooks, journals, and microfilm. Tuttle added the doctor might also have made the wrong diagnosis. Honigman said the benefit of *Poisindex* was that once a diagnosis was made, the information could be printed off in the emergency room and handed off to another department. The software could also print out the specific dosages of medication required for a child based on their age and estimated weight.

Kildall asked if doctors ran the risk of being sued for malpractice if the information in *Poisindex* was wrong. Honigman said it was a gray area as far as the courts were concerned. Nobody had an answer yet. He thought that just as medical textbooks were historically deemed appropriate sources of information, so too were computers.

Cheifet noted that doctors seemed to be slower in adopting computers than lawyers or business professionals. He asked Tuttle why that was. Tuttle said one issue was the fundamental confusion about the worth of the doctor's judgment. Some medical professionals took pride in making a diagnosis from memory, while no mathematician or engineer would design a bridge and say, "I'm giving my client more of their money's worth because I designed it in my head rather than using formulas." Honigman added that another issue was that until recently, computers had not been very user-friendly. It was easier just to look up information in a book.

Duplicating a Doctor’s Experience in Software

Wendy Woods presented her second remote segment, this time from Pacific Presbyterian Medical Center in San Francisco (now known as California Pacific Medical Center), where she discussed *PUFF*, an artificial intelligence system used to diagnose lung disease. Dr. Robert J. Fallat designed *PUFF* in conjunction with Stanford University. Woods said the system duplicated Fallat’s own thought processes. It assimilated data from patient tests and translated it into the diagnosis that Fallat would make himself. Michael Kerrins, a staff member at Presbyterian Hospital, said *PUFF* spoke the same way that Fallat spoke, even using his punctuation.

Woods said that *PUFF* ran on a Tektronix terminal connected to a hard disk drive. Its central memory bank was currently being revised for the first time in four years. If the new version proved successful, *PUFF* would take on the name *MicroPUFF* and work on personal computers. And it would be commercially available from Medical Graphics, a company based in St. Paul, Minnesota.

Woods said the biggest selling point for this type of software was the time savings. Kerrins said that time savings was “phenomenal.” Presbyterian had been able to increase its patient load by 100 percent using *PUFF* over the past two years, he said, without having to increase its staff.

Woods noted that medical costs were currently rising at three-to-four times the national inflation rate. But that wasn’t the case at Presbyterian’s pulmonary lab thanks to *PUFF*. When you hired a computer instead of people, she quipped, you saved money.

Using Computers to Help Front-line Medical Personnel in Developing Countries

For the second and final round table, Dr. Chandler R. Dawson and Dr. Mark Musen joined Cheifet and Kildall. Kildall commented to Musen, a doctor who specialized in computers and medicine at Stanford University, that when he was in school 10 years earlier there was always some AI project going on related to medical diagnosis. Had there been any progress on that front in the last 10 years? Musen said there had been “enormous” progress. He noted that much of the research in artificial intelligence had been directed at the medical field. He added that the work completed over the past decade was now starting to be put into practical use.

Kildall asked Musen about his own expert system project. Musen said it was called ONCOCIN, which provided advice to doctors taking care of chemotherapy patients. Kildall asked if this was being used on actual patients. Musen said it was being used in an experimental trial at Stanford’s oncology clinic.

Kildall asked if the doctors liked the system. Musen said doctors approached using computers and software like ONCOCIN with “some degree of ambivalence,” although they were surprised at how well it gave advice in certain contexts. When expert faculty members reviewed cases where the treating physician’s diagnosis differed from the computer, the expert sided with the computer about half the time and the doctor half the time.

Cheifet asked for a specific example of how ONCOCIN was used. Musen explained the system was used with patients undergoing intensive cancer treatments. Generally that involved many kinds of drugs given in a specific sequence over time. ONCOCIN determined the appropriate treatment based on the patient’s laboratory tests and how they were responding to previous treatments. ONCOCIN could also advise when further laboratory testing was necessary.

Kildall turned to Dawson, an ophthalmologist and director of the Proctor Foundation at the University of California San Francisco, to demonstrate his own expert system, which ran off a PC. (They don’t name this software on-air but it was just called the EXPERT System and originally developed at Rutgers University.) Dawson said his system was developed to diagnose people with eye problems. But it was aimed at health care delivery in developing countries to help front-line workers with very little training.

Dawson then provided a demonstration of his system software running on a normal PC. Kildall mentioned his 14-year-old daughter had an eye infection, so they decided to use her as their hypothetical case. (I'm not going to walk through the specifics here.) Essentially, the expert system asked a series of questions about the patient's symptoms. Dawson explained that the program did not actually make a diagnosis. The doctor still had to enter a presumptive diagnosis and treatment based on the information provided. The software could then advise local health care personnel on what specific actions to take, such as administering topical antibiotics, based on their available resources.

Kildall said this type of software would be appropriate for use with a hand-held computer. Dawson said that was the goal, to use small portable machines with erasable programmable memory (EPROMs). But ideally they could use something like CD-ROM technology as that would allow the system to show pictures to illustrate various medical conditions.

Cheifet asked if this technology could eventually be adapted for home computers in the United States. Dawson said that would be a potential goal, particularly for helping people to sort out problems that were serious from those that were not as serious.

Kildall asked how close Dawson's system was to being a completed product. Dawson said it was still in a "beta testing" phase. The plan was to conduct field tests of the system in north Africa during the winter of 1986.

Kildall asked both guests if they actually saw expert systems like these replacing the traditional medical diagnosis process over the next 10 years or so. Musen said that was a difficult question because most of the current work was still experimental. He said there were still a lot of fundamental questions in artificial intelligence that needed to be solved before we would see many practical expert systems.

Cheifet asked Dawson if computer training was getting into medical schools. Were doctors learning about this type of technology? Dawson said it was being introduced more and more at the medical school level. At the postgraduate level in particular doctors were using computers to access the National Library of Medicine database to look up specific subjects quickly.

Why Computers and Doctors Were a Natural Match

In his closing commentary, George Morrow said computers and medicine went well together. He said there were three reasons for this. First, computers were now a part of a doctor's life from the time they started school until well into their practices. Second, medicine by its nature was filled with "disappointments and failures," and any device that reduced that offered powerful psychological feedback for the doctor. Third, doctors were trained to be suspicious of data, whether it was from an experiment or the symptoms of a patient. When doctors applied this same suspicion to computers, they made sure that the software was well tested.

Motorola Proposed Wireless Computer Networking While Mitsubishi Debuted First Picturephone

The Internet Archive's record of this episode is actually a rerun from May 1986, so that's when this "Random Access" segment by Stewart Cheifet originally aired.

- Apple president John Sculley told industry analysts that the company would soon offer MS-DOS as an option on the Macintosh. Apple would not get into the PC clone business, Sculley said, but both MS-DOS and UNIX would be available on future Mac systems.
- Sperry and Burroughs were in merger talks. The combined firm would have annual computer sales of over $10 billion, Cheifet noted, making it second only to IBM. Both companies' stock prices had soared, indicating strong support for the deal.
- The British Library had been looking to convert to optical storage. But after testing CD-ROM, Cheifet said the British were challenging

claims that laser disc storage would “last forever.” The Library said its research found that within 10 years, the coating on the discs would crack, leading to oxidation of the underlying aluminum surface. While such cracks would not affect audio or data, it would be “catastrophic” for archival storage of data.

- The Federal Communications Commission requested comments on a proposal by Motorola to create a “wireless computer network.” Motorola wanted to connect local computers and peripherals up to 500 feet using low-powered radio frequencies.
- The House Judiciary Committee sent a computer crime bill to the floor.
- Paul Schindler reviewed *An Apple a Day* (Avant Garde Publishing Corporation, $79.95), a program to help users keep their medical records and emergency contact information on a floppy disk. It also included an online medical encyclopedia. Schindler said the program was a great idea but “tedious to look at” given the lack of color.
- Toshiba released the first AT-compatible laptop, which featured a full-size gas plasma display, a 1O MB hard drive, and a 3.5-inch floppy disk drive. Data General also announced its second-generation laptop, the DG-2, which had an electroluminescent display, 10 MB hard disk, and up to 640 KB of RAM.
- The June 1986 *Sharper Image* catalog would feature the world’s first “picturephone.” The technology had been around for 20 years but never quite taken off, Cheifet said. But Mitsubishi was now releasing a home picturephone priced at under $1,500. It sent still photos over ordinary phone lines, but you couldn’t talk while the system transmitted the pictures.
- Carnegie Mellon University had a new project called *Sexpert*, a sex therapy program developed by Dr. David Servan-Screiber. Cheifet said the program asked couples approximately 100 multiple-choice questions and recommended a treatment program.

Medical Expertise in BASIC?

Medical technology is a difficult field for a layperson like myself to research and comprehend. So I won’t delve much into the various products demonstrated in this episode. But I do have a couple of comments. The first is that many developers of these early medical expert systems used BASIC to convert their software from minicomputers–which was usually written in something like LISP–to PCs. This was done with both *PUFF* and Dr. Dawson's EXPERT system. Indeed, Dawson and several colleagues wrote in a 1984 paper for the *Journal of Medical Systems* that they translated their original software model, which was built on a DEC-20, to BASIC code that could run on an IBM PC, Apple IIe, or Epson HX-20 hand-held computer.

My second note relates to the Cemax-1000. Although discussed here purely in the context of medical imaging for use in surgical reconstruction, this was in fact an early 3-D graphics computer. Contemporary reporting talked about the Cemax as a competitor to the Pixar Image Computer and the Silicon Graphics IRIS workstations. For example, in a 1987 article for *Computer Pictures*, Abigail Christopher said that Pixar's machine was actually being used in beta testing to not only design artificial limbs and joints but also help doctors rehearse procedures, something the Cemax could not do.

Notes from the Random Access File

- This episode is available at the Internet Archive and had an original broadcast date of November 12, 1985, although as previously noted the episode I reviewed was a rerun that aired on May 9, 1986.
- Anthony Mandia, the artificial heart patient referenced by Stewart Cheifet in his opening, suffered from cardiomegaly, i.e., an enlarged heart. According to an account of Mandia's case published by Penn State in October 1985, Mandia's heart was twice the normal size of a healthy heart and was in congestive failure. On October 17, 1985, doctors realized Mandia's condition was critical, and lacking an available donor heart, Penn State cardiologist Dr. Dwight Davis recommended implanting the artificial heart. The procedure took about four hours. The artificial heart was only meant to be temporary until a donor heart could be found. Sadly, it never was, and Mandia died due to "organ system failure secondary to overwhelming infection," according to the Associated Press. Mandia was 44. United Press

International added that 11 people, including Mandia, had received an artificial heart up to that point, and only five were still living.

- Dr. Chandler R. Dawson died in March 2013, according to a short obituary published in Princeton University's alumni newsletter. Dawson received his medical degree from Princeton in 1952 and served as director of the Francis I. Proctor Foundation at the University of California San Francisco from 1984 until 1995. The Proctor Foundation focuses on the study of trachoma–an infection that causes blindness–and other eye diseases.
- Dr. David White's Contour Medical Systems later changed its name to Cemax, Inc., reflecting the name of the company's main product. Cemax merged with ICON Medical Systems in 1995 to form Cemax-Icon, Inc. In 1997, Imation Corporation acquired Cemax-Icon in a cash-and-stock deal valued at $79 million. A year later, in December 1998, Imation sold Cemax-Icon to the Eastman Kodak Company. Kodak, in turn, consolidated Cemax-ICON into its preexisting medical imaging business. As for Dr. White, he's still licensed and presumably practicing as a plastic surgeon in California.
- Dr. Benjamin Honigman spent 33 years at the University of Colorado School of Medicine and retired in 2018. Honigman's work in emergency medicine focused on the impact of high altitudes on the human body and he served as director of the hospital's Altitude Medicine Clinic from 2003 to 2014.
- Dr. Mark Musen is still with Stanford University after nearly 40 years, having started as an internal medicine fellow back in 1983 and serving as director of the Stanford Center for Biomedical Informatics Research since 1993.
- As far as I know, Apple never released any MS-DOS or UNIX-compatible Macs during John Sculley's tenure. It was possible to emulate DOS functionality on many early Macs using software, as illustrated by this 1992 Apple brochure. But the only example of a DOS-compatible Mac that I'm aware of was the Power Macintosh 6100/66 released in 1995. (Credit to Clint Basinger of LGR for that information.)
- The merger of Burroughs and Sperry went through to form Unisys Corporation, which still exists today.

- The FCC received a bunch of comments but never took any formal action on Motorola's wireless networking proposal. This was *not* the precursor of modern wi-fi, which is based on the IEEE 802.11 standard developed in the 1990s.
- If Paul Schindler was lukewarm about *An Apple a Day*, Cynthia E. Field of *InfoWorld* was positively hostile. Her review dismissed the program as "unpolished" and filed with information that was "trite and useless in emergencies." She noted the software included multiple "printed disclaimers of any responsibility by the publisher for the reliability and accuracy of the program's information." This prompted a defensive letter to the editor from Avant Garde president Tom Measday, who said the disclaimers "were not our choice but a requirement of our attorneys." The editors fired back, "While lawyers may demand that publishers absolve themselves from responsibility for information provided by software, buyers are less likely to do so."
- That Toshiba AT-compatible laptop was known as the Toshiba T3100. It originally retailed for $4,495. The Data General laptop would actually be called the Data General/One Model 2 and retail for $4,635.
- The Mitsubishi picture phone was known as the Lumaphone (or Luma LU-1000) and it actually began as a project at Atari, Inc. Atari had established a division called Ataritel back in 1981 to work on telecommunications projects, including a videophone. After the sale of Atari's home video game and computer assets to Jack Tramiel in July 1984, Warner Communications retained Ataritel for a short time before selling that division as well to Mitsubishi.

Chapter 10: Grolier's KnowledgeDisc, InfoTrac, DEC Uni-File, and ISIDOS

Gary Kildall was not just the co-host of *Computer Chronicles*. He also co-founded and ran two software companies, Digital Research and KnowledgeSet (originally Activenture). As a software guy, Kildall was naturally interested in the newest means of distributing programs. Back in the first season of *Chronicles*, Kildall touted the potential of two possible magnetic disk replacements–the Capacitance Electronic Disc and bubble memory–neither of which panned out in the market.

But the third time was a charm, right? At least that was Kildall's hope when he started Activenture to develop CD-ROM technology. The CD-ROM had also been featured on *Chronicles* before, when a Sony representative suggested we would see compact discs in computers by the end of 1985. Kildall certainly believed that would happen. Indeed, at the 1985 Summer Consumer Electronics Show, Activenture demonstrated its first CD-ROM product–an electronic version of the Grolier's Encyclopedia–running off a CD player connected to an Atari 520 ST.

Now, I'll talk more about Atari's role in all this after the episode recap, but suffice to say Jack Tramiel's company never actually shipped a computer with a CD-ROM drive to consumers in 1985. But the CD-ROM encyclopedia was certainly real and it played a featured role in this next *Chronicles* episode that originally aired in November 1985.

Small Step or Giant Leap?

This episode's theme was "optical data storage." Stewart Cheifet used a warehouse filled with boxes as the prop for his cold opening. He said it would take about 200 file boxes–or about 1,500 floppy disks–to match the storage capacity of 1 compact disc. In the studio, Cheifet had some more props, this time an assortment of optical storage devices that had come out during the past year, including a laser video-disc machine, a compact disc player, and a computer CD-ROM drive.

Cheifet asked Kildall if optical storage was just another "small step" forward in technology or was this a "giant leap" in technology. Kildall, admitting his biases in this area, noted that the industry had been working with magnetic storage since the 1940s. Optical storage could now get us a higher magnitude of information in the same amount of space. And if we could organize and index that large amount of information, then we could replace whole libraries–and maybe even the printed page someday.

Optical Discs Offered Higher Capacity But Still Faced Questions

Wendy Woods presented a brief report explaining the basics of optical storage technology. Narrating over B-roll, Woods said traditional magnetic storage could soon become a "fringe accessory," as the vastly more powerful optical disc came close to mass production. Offering up to 1,000 times more storage than magnetic media in the same format, the read-only optical disc recorded information in small pits or "bubbles" burned in by a high-intensity laser. These encoded marks, much smaller than those on magnetic disks, were later read back by a low-energy laser beam.

Woods said the long-awaited "erasable" disc was actually a magneto-optical medium that used a laser to change the polarity of magnetized spots on the light-sensitive surface. Still in its infancy, the industry was dealing with several competing standards, from 120-millimeter read-only CD-ROMs to 130-millimeter five-and-a-quarter-inch writable discs.

Dr. Dave Davies, the general manager of 3M's optical recording group, told Woods that CD-ROM was ideal for prerecorded databases where you would logically go in sequential fashion. But it was too slow for direct access to computer information, particularly software. 3M saw the need for a "rapid access" version where the disc would rotate at a constant angle or velocity and the optical head would zip back and forth reading the format information. The key was that read-once and erasable discs had to be physically interchangeable in the same drive.

Woods said the enormous capacity of CD-ROM–approximately 250 MB per side–had drawn increased attention from manufacturers at a time when computer sales were leveling off. Davies said the industry was in a slump because most computers were simply gathering dust due to the lack of enough easy, accessible software that made it worthwhile to use the machine. Optical storage provided an important part of the jigsaw puzzle in making computers useful to the average person.

As with the first personal computers, Woods noted, finding clever uses for the optical disc’s voracious storage was just a matter of time. But for a technology that showed such promise from the start, the future was even more remarkable. Davies said there was a very clear route for optical storage–to continue increasing the density of the disc to the point where the storage capacity started to approach that of the human brain itself.

A 20-Volume Encyclopedia Reduced to a Single Compact Disc

Tim Oren and Dr. Bob Kalthoff joined Cheifet and Kildall for the first round table discussion. Oren was one of Kildall’s employees, working as a user interface designer at Activenture. Kalthoff was the co-founder and CEO of Ohio-based Access Corporation.

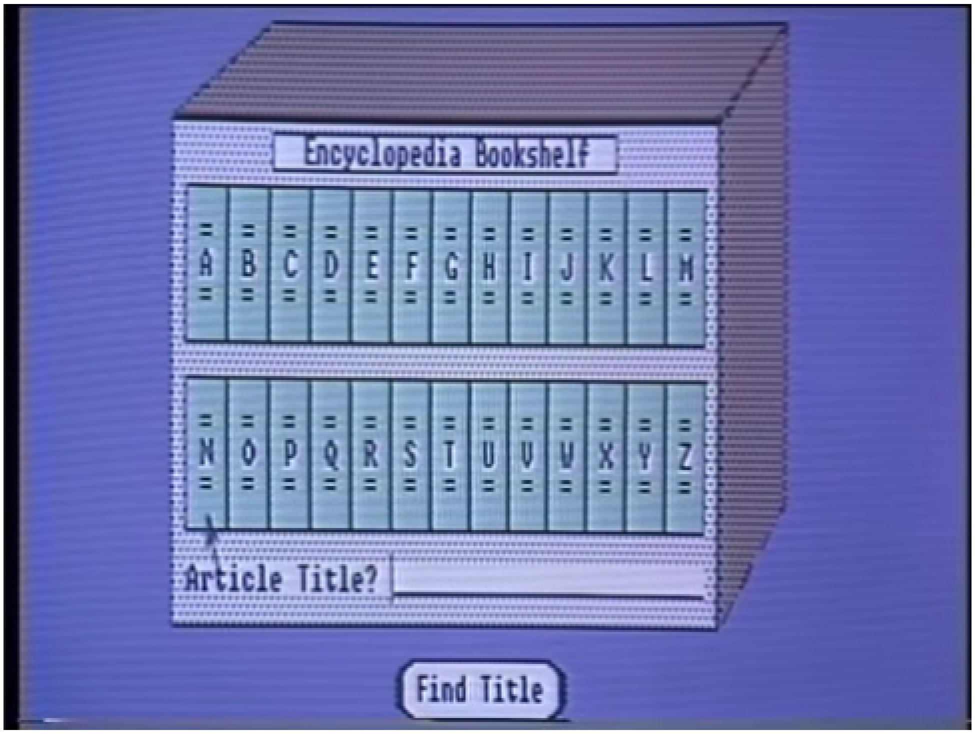
Chiefet opened by asking Kildall what it was about optical storage that got him so fascinated. Kildall explained that about two years earlier, he was directing a product at Digital Research involving video discs. After the project was dropped, Kildall asked his board for permission to form a separate company to pursue optical publishing. He said his main motivator was figuring out what to do with all the information you could store on an optical disc. He said an encyclopedia was a logical prototype, so they decided to start there.

Cheifet turned to Kalthoff and asked if optical storage was something that would replace magnetic storage devices or instead work with them.

Kalthoff said it was certainly “with”; he doubted that optical would ever replace magnetic storage. Cheifet asked why. Kalthoff said that we were at least five years away from the point where optical discs would even be possible for desktop computer applications. In the meantime, we’d likely see the availability of erasable optical-disc media that would be more effective in PCs.

Cheifet then asked Oren to demonstrate Activenture’s CD-ROM encyclopedia, known as the *Grolier’s KnowledgeDisc*. There was also a full set of the printed *Grolier’s Academic Encyclopedia*–all 20 volumes–as a dramatic prop. Cheifet said Kildall claimed all 20 of those volumes could be squeezed onto a single four-and-three-quarters-inch compact disc. Did he do it? Kildall said yes, although the CD-ROM version was text-only. He noted that the encyclopedia was actually stored in a ring about three-eighths of an inch thick on the disc, representing just 20 percent of its total storage capacity. And of the information stored, about half was the text of the encyclopedia and the other half was indexing information.

Cheifet asked Oren about the user interface design for the *KnowledgeDisc*. Specifically, how was using a mouse and a keyboard easier than just picking a book up off a shelf? Oren showed the main index for the *KnowledgeDisc*, which as he explained was arranged to look like books on a bookshelf (see below). The user could then just use the mouse to “point” to the volume they wanted to access.



The main menu of the Grolier’s KnowledgeDisc. The interface resembles a bookshelf with two rows of encyclopedias, one volume for each letter of the alphabet.

As an example, Oren selected volume “A,” and clicked through a series of “finer and finer” index divisions to reach an article about the polar explorer Roald Amundsen.

Cheifet asked about the amount of storage involved with the *KnowledgeDisc*. Kildall said it was a 550 MB disc, which if printed out was enough to stretch 10 characters-per-inch from San Mateo to Denver.

Cheifet then asked about the search capabilities of the *KnowledgeDisc*. For example, how would he find information about “PBS” if there was no specific article with that title? Oren demonstrated the program’s word search function. A basic search for “PBS” found 33 occurrences in 16 articles. Kildall added you could also perform more complex boolean searches. For instance, Oren noted that some of the search results for “PBS” were for the chemical compound lead sulfide (PbS), so he redid the search excluding any results with the word “lead.”

Cheifet turned back to Kalthoff and asked how this technology was being used in industry. Kalthoff said the *KnowledgeDisc* was a “replicate” technology where each disc was stamped. His company dealt in write-once, read many times (WORM) discs, where a document was scanned and converted into a digital bitmap and fed into a 12-inch disc by a focused laser. The 12-inch discs had a capacity of 1 GB.

Berkeley Library Experimented with CD-ROM Databases

Wendy Woods returned with a remote segment from the University of California, Berkeley library, which used the *InfoTrac* CD-ROM database developed by Information Access Company (not to be confused with Dr. Kalthoff’s Access Corporation). Woods said anyone familiar with endless searching through periodical indexes could now appreciate the ease of searching on an IBM PC. Using *InfoTrac*, a video disc could contain the equivalent of a “good wall full of books.”

The system was part of an experiment conducted by the UC library to find the best optical storage reference bank. Bernie Hurley of the library said *InfoTrac* combined a very large and comprehensive database with the power of a microcomputer and allowed people to access information using non-traditional types of searching techniques. Woods said all the user had to do was type a search subject and all of the listings were there. You could even search for subtopics within a larger topic.

Woods noted that each of the *InfoTrac* video discs held 530,000 pages from 1,000 magazines indexed since 1982. She added the system appeared to be user-friendly based on the logs kept by UC students. The system was not cheap, however. Woods said a four-terminal system with monthly video disc updates cost about $16,000 per year.

But as the price came down and the efficiency of the system increased, Woods said that optical storage was expected to become a lot more common in libraries. Hurley added that not only were more and more materials now available in electronic form, some materials were only available that way.

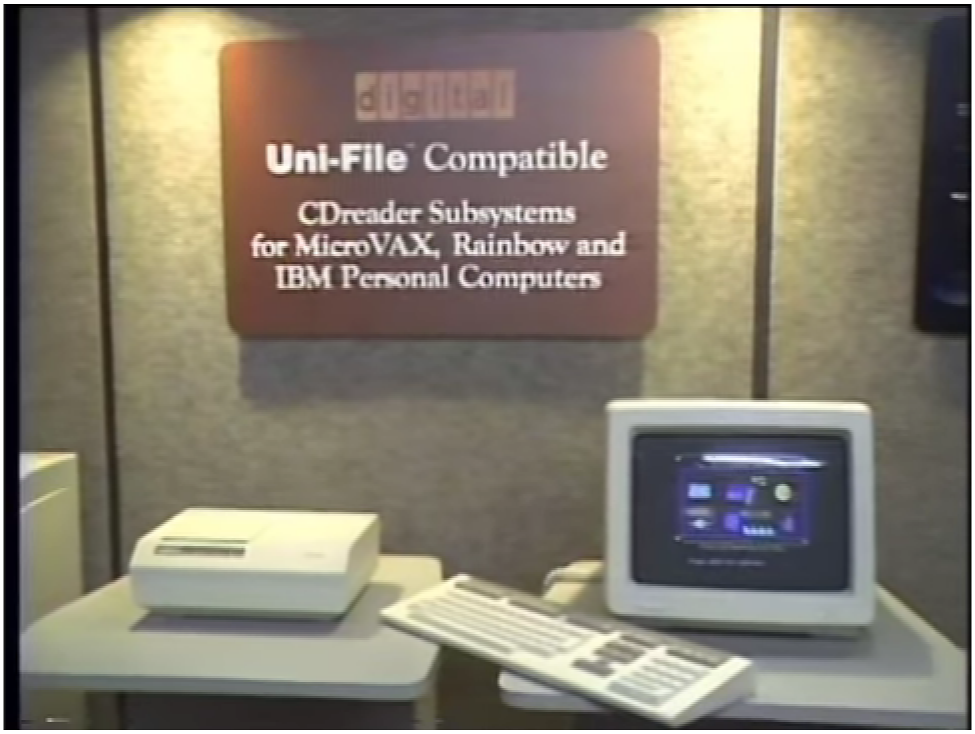
So reference rooms would have to evolve to handle not just traditional books, but materials in electronic form as well.

DEC Entered CD-ROM Market with Uni-File Standard

Stewart Cheifet presented the final remote segment, this one from the Information Industry Association’s 17th Annual Conference & Exhibition, held at the Shoreham Hotel in Washington, DC, from November 3 to 6, 1985. Cheifet said the compact disc (CD) was the “star of the show.”

Why? Because of how much information it could store–600 MB, or about 300,000 pages of work. With that kind of storage capacity, Cheifet added, applications were not hard to find at the show. There were CD-ROM encyclopedias, four years’ worth of newspapers on a single CD, and databases for prescription drugs and real estate listings.

Cheifet said one of the newest players in the optical storage field was Digital Equipment Corporation (DEC), which just came out with a CD-ROM drive for its MicroVax and Rainbow PC. The drive also worked with the IBM PC (see below). DEC offered a variety of scientific and technical databases, as well as customized applications such as a “Factory Information System,” which enabled a manufacturing company to put all of its maintenance manuals on a single CD. A maintenance supervisor could then consult the CD-ROM manual to retrieve repair instructions.



A trade show display of the DEC CDreader for MicroVAX, Rainbow, and IBM Personal Computers. The CD-ROM drive is a larger rectangular unit connected to a computer with a separate keyboard and monitor.

Ed Schmid, DEC’s optical storage marketing manager, told Cheifet the CD represented a “major discontinuity” in the cost of producing and distributing information. It was perhaps the biggest advance in distribution since the invention of movable type and the printing press.

But Cheifet noted the burgeoning CD-ROM business faced several problems. One was the issue of standards. DEC had proposed a format called Uni-File but there was still dissent within the industry over what standard would ultimately prevail. Another problem was the relatively slow access time of optical storage. Schmid said that wasn’t really a problem, however. The access time of a CD, depending on which manufacturer’s product you used, was about one second. That was admittedly slower than magnetic storage, where access time was often measured in milliseconds, but DEC said its user feedback suggested people were impressed with the information retrieval speed of CD-ROM.

The next question, Cheifet said, was when we would see the cost of CD-ROM come down to the point where it was affordable for the average user and not just business customers. He noted that Atari Corporation had promised a $700 CD-ROM drive would soon be available for its 520ST computer. Schmid was skeptical. He noted Atari CEO Jack Tramiel had announced a number of products in the past that never appeared or shipped. Based on DEC's experience, Schmid said Atari would have a "tough time" producing a CD-ROM drive at its promised price point.

Regardless of price, Cheifet said the CD-ROM was still incredible. He noted that if you wanted to transmit all of the information from one CD online, you would have to transmit non-stop at 1200 baud for 46 days.

Was WORM Media the Future of Archival Storage?

Back in the studio, Fred Lloyd joined Cheifet, Kildall, and Bob Kalthoff. Lloyd was the head of software development for Information Storage Inc. (ISI), a Colorado-based company that produced optical drives. Cheifet opened by noting that Activenture's *KnowledgeDisc* had no picture or graphics, just text. But there was a lot of room leftover on the disc. So he asked Kildall why graphics were not included. Kildall said adding images was the next logical step. Beyond that the goal would be to include some simple animations.

Cheifet asked Kildall to explain the difference between CD-ROM and WORM discs, the latter of which was produced at ISI. Kildall said he'd met Lloyd about a year earlier at COMDEX and he'd shown him a prototype for ISI's WORM drive. A CD-ROM was like a book that came pre-printed. But a WORM disc came blank and the user could write onto it once. ISI's discs could store 100 MB per side.

Kildall asked Lloyd what the discs cost. Lloyd said they would sell for about $60 each. ISI's media came enclosed in a tough plastic cartridge with a steel door (similar to a 3.5-inch floppy disk but larger). Kildall asked how people would use this type of drive. Lloyd said it could be used not only for backup but also online data–things that you used every day but did not change, such as documentation.

Kildall asked how a WORM drive would work with an IBM PC. Lloyd said the initial setup involved plugging in a card like you would any peripheral and running a simple installation program.

Cheifet noted that you could store about 1,600 files on a 100 MB WORM disc. How could you manage all that information? Lloyd said it was managed using ISI's proprietary software, *ISIDOS*, which came with the drive. Lloyd then demonstrated *ISIDOS*, an add-on to *PC-DOS*, with the former helping the latter understand write-once media. Regarding Cheifet's earlier point, while Lloyd's sample WORM disc contained 1,600 files, the maximum capacity was up to 65,000 files. (Cheifet noted there was still 111 MB free on Lloyd's demo disc.)

The demonstration itself was just the directory structure of *ISIDOS*. One thing Lloyd pointed out was that you could keep multiple versions of the same file archived on the disc, which was something you wouldn't see on a magnetic drive. The revision system let the user see how their files changed on a daily basis. Kildall noted this made the WORM disc a perfect archival medium.

Cheifet asked about the process of actually writing to the WORM disc. Lloyd said you could use standard DOS-style commands. And if you wrote a file with a previous version, the system would take note of that fact. Kildall said that short of scratching the disc surface, there was no way to get rid of a file once it was written. Lloyd said that was correct.

Cheifet asked Kalthoff about the application of WORM disc technology to industry and the workplace. Kalthoff said in his field they used this technology to implant 20,000 documents at 50,000-bytes (compressed from 4 million) onto a 12-inch, 1 GB disc. That information could then be transmitted to high-resolution terminals across an office. Kildall asked how the original information was stored. Was it microfiche? Kalthoff said yes, his company dealt primarily with engineering drawings, which originated as 35-millimeter film images.

Would Consumers Pay for CD-ROM?

In his closing commentary, George Morrow acknowledged the dazzling amount of storage space on a CD-ROM. But he noted bubble memory previously promised similar capacity and millions of dollars was spent on its potential–most of it in vain.

Any technology that had potential was going to be attractive, he said. But to really succeed it needed to fit into the environment it intended to serve. The read-only nature of CD-ROMs required specialized software and unique applications to make it fit within the normal operating system environment of a computer. Even worse, there would need to be different software for each operating system. And software was typically the most difficult and time-consuming part of any development project.

Morrow said another attribute that CD-ROM shared with bubble memory was the high cost. A CD-ROM player would cost at least $800 while their audio counterparts only ran about $200 to $300. The difference in price between the two would likely present a formidable barrier to home adoption.

Apple Promised Six New Computers By End of ’86

The Internet Archive’s record of this episode is actually a rerun from May 1986, so that’s when this “Random Access” segment by Stewart Cheifet originally aired.

- Apple reported that for the first time, the Macintosh earned more money for the company than the Apple II. This was based on sales figures from the first quarter of 1986. Cheifet noted that Mac sales had boomed primarily due to desktop publishing.
- Apple also promised to release six new computers over the next 12 months. The first new product was expected to be the Apple IIx, a 16-bit computer that would be compatible with the IIe and IIc and

possibly feature a detachable keyboard, built-in networking, a color graphics card, and four expansion slots.

- Zenith announced the first new CRT technology in several years. The new Zenith flat tension mask (FTM) promised to eliminate face-plate reflection.
- The Internal Revenue Service ruled tax software that provided "substantive tax instructions" would be considered a "tax return preparer" subject to potential legal liability and fines. Cheifet noted this ruling could put the tax software companies out of business.
- The Intel-NEC copyright lawsuit was headed to trial. The key issue was whether the microcode on a computer chip was "software" or "hardware." Software can be copyrighted, Cheifet explained, while hardware could only be patented.
- Paul Schindler reviewed *Zoomracks* (Quick View Systems, $125), a database management program that displayed information as a series of cards. Schindler said the software "wasn't perfect" but it was interesting and relatively cheap for a database program.
- California's proposed computer privacy bill moved to the state Senate. In New York, that state's legislature was considering a bill to criminalize "computer trespass."
- The University of Maryland recently completed a study on the impact of personal computers on office work. Among other findings, managers moved from handwriting first drafts to typing them on computers, making less use of secretaries. Cheifet said other impacts included the move of financial analysis from mainframes to PCs and workers using copiers less as they could now use printers.
- A Virginia Tech researcher was trying to find one of the world's earliest computers, the Harvard Mark III, which was reportedly dumped in a Maryland landfill in the late 1940s.

Robert J. Kalthoff, M.D. (1925-2002)

Dr. Robert Kalthoff was a psychiatrist by training. He earned his medical degree in 1948, and following six years of service in the U.S. Air Force completed his residency at hospitals in New York City and Cincinnati. He would eventually become a clinical professor at the University of Cincinnati.

In 1960, Kalthoff and a colleague, Dr. Paul Ornstein, started working on an automated document storage system for medical records. This led to the creation of Access Corporation in 1963. Two years later, Access released what a Cincinnati newspaper of the time described as a "non-electronic, electromechanical unit" that could search "an almost unlimited number of file cards in a matter of seconds." Access initially leased its units for around $100 per month. The final product was not targeted specifically at the medical field–the first buyer was actually Xerox, which installed the unit in its Cincinnati branch office.

As best I can tell, Access Corporation remained a small, privately owned manufacturer of document management and imaging systems until its dissolution in November 1998. Kalthoff stepped aside as CEO in the late 1980s but remained chairman of the board. He passed away in August 2002 at his summer home in Michigan, according to the *Cincinnati Enquirer*.

KnowledgeSet's Software Plans Hampered by Atari's Failure to Deliver on Hardware

I briefly discussed Gary Kildall's Activenture in a prior post featuring Tom Rolander, who was the company's vice president of engineering. As Kildall mentioned in this episode, he spun Activenture out of an abandoned CD-ROM project at Digital Research.

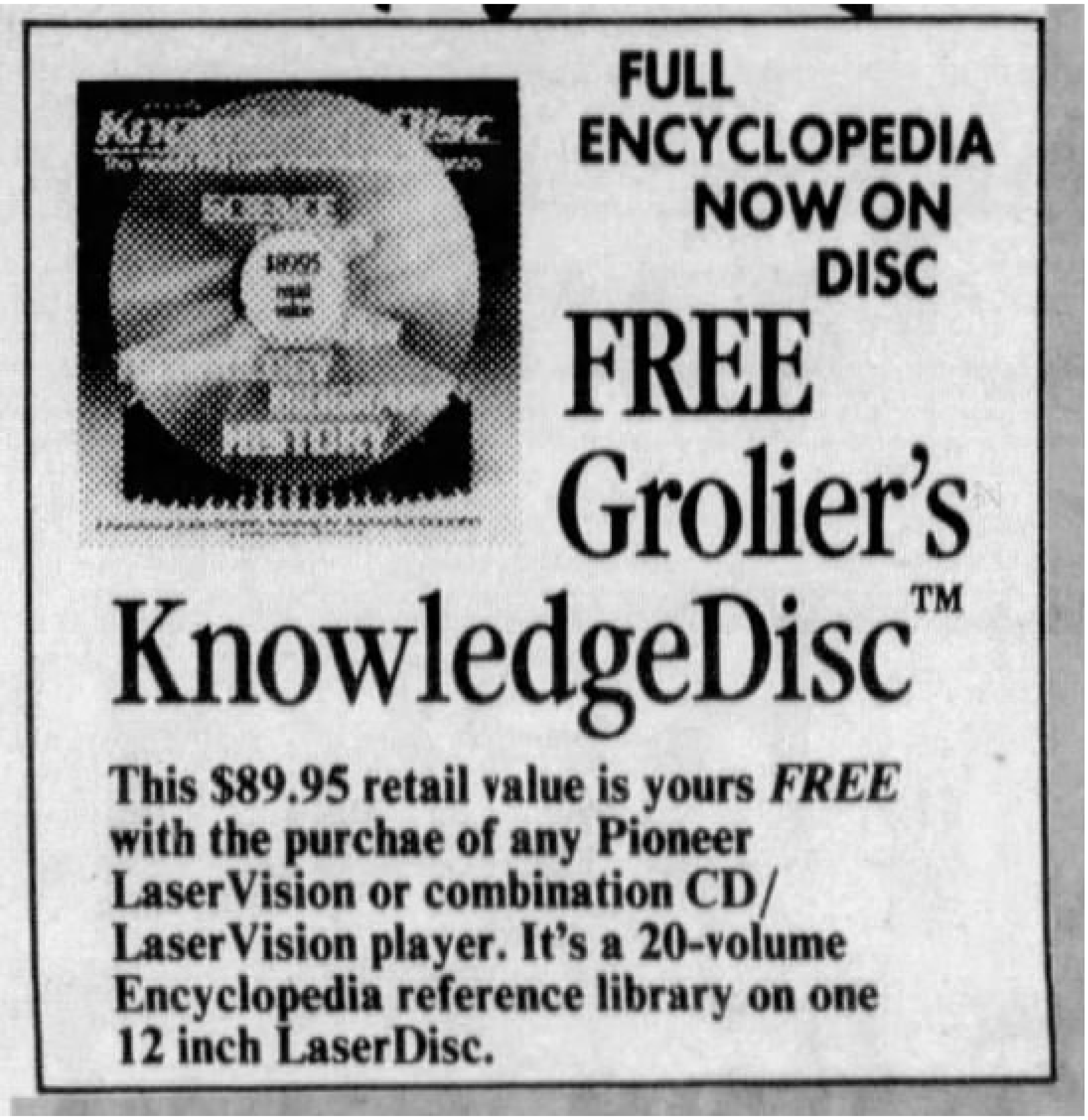
Although the *Grolier's KnowledgeDisc* was not released until a couple weeks after the episode first aired–sometime in early December 1985–the CD-ROM encyclopedia made its initial debut at the Summer Consumer Electronics Show back in June 1985. Activenture produced a demo of the program running on a CD-ROM attached to an Atari 520ST.

Now, you'll recall Stewart Cheifet mentioned Atari's plans to release a consumer CD-ROM for under $700, as well as DEC's Ed Schmid suggesting this was yet another case of Jack Tramiel promising something he could not deliver. It turned out Schmid was right. The Atari CD-ROM drive never quite materialized. Nearly five years after that CES demo, Tom Byron wrote in *STart Magazine* that Atari was *still* insisting that their CD-ROM drive was just around the corner:

> To what exactly the delays can be attributed are varied and complex to be sure, but one in particular stands out: a distinct lack of software.
>
> "It's basically a 'chicken and egg' situation," Atari Corp. president Sam Tramiel told a room full of dealers and developers at last spring's Comdex. "You can't sell hardware that has no software, but on the other hand, who's going to develop software for a product that doesn't have a market yet?"

As far as I can tell, Atari never sold any CD-ROM drives to consumers. Scattered posts on Atari message boards suggest that there were as many as 1,000 "developer kits" that may have made their way into stores unofficially. But the promise of the 520ST as an entry-level optical storage machine was simply never fulfilled.

Indeed, as early as January 1986, Gary Kildall realized that Jack Tramiel had screwed him over on producing a CD-ROM drive. (Tramiel, perhaps heeding George Morrow's warning, reportedly wanted to wait until CD-ROM players came down in price to match audio CD players.) Wendy Woods reported on *The Source* that Activenture had decided to produce its own sub-$1,000 hardware-software package that included a player, controller, and the *Grolier's KnowledgeDisc*. I don't know if Activenture ever produced such packages, but I did find a number of newspaper ads offering a free *KnowledgeDisc* with the purchase of certain optical storage drives.



FULL ENCYCLOPEDIA NOW ON DISC

FREE Grolier's KnowledgeDisc™

This $89.95 retail value is yours *FREE* with the purchae of any Pioneer LaserVision or combination CD/ LaserVision player. It's a 20-volume Encyclopedia reference library on one 12 inch LaserDisc.

A newspaper advertisement for the Grolier's KnowledgeDisc. "This $89.95 retail value is yours FREE with the purchase of any Pioneer LaserVision or combination CD/LaserVision player. It's a 20-volume Encyclopedia reference library on one 12 inch LaserDisc."

Also in early 1986, Activenture also changed its name to KnowledgeSet after Activision–the video game publisher–complained. The name change was announced at a March 1986 conference hosted by Microsoft in Seattle to discuss CD-ROM technology. Kildall and Microsoft CEO Bill Gates were the featured speakers.

That conference produced yet another wrinkle in the battle over optical storage standards. Philips and Sony surprised everyone–including host Gates apparently–by announcing their new Compact Disc-Interactive (CD-i) standard, which promised the ability to combine audio, text, and graphics on the same media. But once again, promises did not immediately translate into reality, and it would be several years before CD-i made its way into any consumer products.

Meanwhile, the CD-ROM standard backed by a group of companies, including Microsoft and DEC, started to take off. Originally known as the "High Sierra" format, this morphed into the CD-ROM standard that became widely adopted for computers in the 1990s and early 2000s. DEC's Uni-File was essentially a proprietary version of the original High Sierra standard. It never gained much adoption outside of DEC's own products and was dropped by the early 1990s. DEC also quickly exited the software side of the CD-ROM business, discontinuing the database products mentioned by Cheifet in August 1986.

As I noted in my prior post, Gary Kildall didn't stay in the CD-ROM market much longer either. He sold a majority interest in KnowledgeSet to the Wisconsin-based George Banta Co. Inc. in September 1987.

Notes from the Random Access File

- This episode is available at the Internet Archive and has an original broadcast date of November 19, 1985.
- Tim Oren joined Apple after leaving Activenture/KnowldegeSet. He went on to work for a number of different companies in the 1990s, including a two-year stint at CompuServe, where he led that company's ill-fated efforts to transition from proprietary online services to the Internet. Oren would spend the 2000s working in venture capital before retiring in 2018.
- After leaving DEC, Ed Schmid started his own company, Simplify Development Corporation, in 1992. Later renamed eCopy, the New Hampshire-based company initially focused on creating software to convert paper documents into digital form. The firm later shifted into partnering with copier manufacturers, who offered eCopy's technology

as a scanner upgrade. Schmid spent 17 years as eCopy's CEO before selling the company in 2009 to Nuance Communications for $54 million. Since 2010, he's been a private investor.

- Fred Lloyd only had a brief stint at ISI. By 1988 he was a datacenter manager at Sun Microsystems, where he'd spend the next 19 years before retiring in 2006. Lloyd remained interested in optical storage technology, however, creating a database of Ham radio operators in 1992 called *QRZ*, which he produced until 2009. Lloyd also started a website for the project called QRZ.com that is still active today.
- The *InfoTrac* database was produced by Information Access Company (IAC), which was founded in 1977 and acquired by Ziff-Davis Publishing in 1980. *InfoTrac* continued as a CD-ROM database until the mid-1990s, when Ziff-Davis sold IAC to The Thomson Corporation. Thomson later merged IAC and *InfoTrac* into its Gale subsidiary. Gale, in turn, was sold to Cengage in 2007.
- Information Storage Inc. was acquired in 1989 by Literal Corp., a California-based joint venture co-owned by Eastman Kodak, C. Olivetti & C. SpA., and Kawasaki Steel Corporation.
- The Apple IIx would be released in September 1986 as the Apple IIgs. The final machine largely matched the specs described by Stuart Cheifet. Apple did not meet its six-machines-in-six-months promise, however, as the company did not release any further new computers until January 1987.
- The NEC-Intel lawsuit was about the microcode used in the Intel 8086/88 series of microprocessors. NEC filed a preemptive lawsuit asking a judge to decide if its own Intel-compatible microprocessors violated copyright law. In September 1986, U.S. District Judge William A. Ingram ruled that microcode was in fact "software" protected by copyright. Ingram later recused himself from the case after NEC discovered the judge belonged to an investment club that owned 60 shares of Intel. A different judge later held that NEC did not infringe any of Intel's copyrights.
- Speaking of intellectual property lawsuits, the developer of *Zoomracks* sued Apple in 1989, alleging the latter's *HyperCard* system infringed on a number of his patents. Apple settled the lawsuit by agreeing to pay the developer, Paul Heckel, a one-time licensing fee.

- The Information Industry Association merged with the Software Publishers Association in 1999 to form the Software & Information Industry Association, which still exists today.

Chapter 11: Amiga Workbench, Deluxe Paint, NEOchrome, and VIP Professional

The term “home computer” was always a bit vague. Even today, I know there is some debate among tech historians over what machines actually fit that description. For example, was the Apple II a home computer despite the fact it cost substantially more than, say, a Commodore 64?

In my own review of this period, I’ve come to look at the Home Computer Era as extending from roughly 1977 to 1985. It was in April 1977 that former *Chronicles* host Jim Warren’s first West Coast Computer Faire featured the debut of the Apple II, the Commodore PET, and the Tandy TRS-80, the so-called “trinity” of early home computers.

That still doesn’t explain what a home computer was, however. I would say that for the most part–the TRS-80 being a notable exception–the Home Computer Era featured 8-bit machines running some variant of the MOS Technology 6502 microprocessor. (The TRS-80 was based on the Zilog Z80, which was common in many CP/M machines, but less-so in home computers sold in North America.)

Now strictly speaking, a number of video game consoles used the 6502 as well, such as the Atari 2600 and the Nintendo Entertainment System (NES). This brings me to my next point. The home computer was essentially a merger of early hobbyist computers, such as the Altair 8800, and video game consoles. Put another way, a home computer was a machine that made it easy to both play games and learn programming.

By 1985, the Home Computer Era was in its twilight, with the Apple II and the Commodore 64 as the two survivors. That’s not to say that home computers stopped selling in 1985. To the contrary, Apple and Commodore continued selling their 8-bit machines well into the early 1990s. But you no longer saw any new entrants into the home computer market by 1985.

Two things basically happened. First, the video game console market reconstituted itself following the collapse of the original Atari, Inc., in early 1984. The NES took its first steps into the North American market in late 1985. The second thing was the release of the Atari 520ST and the Commodore Amiga, which was previewed in an earlier *Chronicles* episode featuring Commodore founder-turned-Atari savior Jack Tramiel.

The 520ST and Amiga–also known as the Amiga 1000–were 16-bit computers based on the Motorola 68000 CPU, which also powered the Apple Macintosh. They represented a clean break with the Home Computer Era. For one thing, these were not machines you bought to learn how to program in BASIC. And while the 520ST and Amiga are remembered today largely as gaming machines, they also introduced next-generation improvements in graphics and sound technology, which signaled the direction that the bigger players in the industry would move towards during the latter part of the 1980s.

This next *Computer Chronicles* episode from early December 1985 focused on the similarities and contrasts between these new 16-bit machines. Obviously, Commodore and the new Atari were linked by Jack Tramiel. But these companies that were once at the forefront of the home computer and video game console markets, respectively, now found themselves competing to catch up in a larger personal computer industry dominated by the IBM PC and Macintosh platforms.

Would Software Makers Step Up to the ST and Amiga?

Stewart Cheifet opened the program by showing off the prior generation of Atari and Commodore machines, the Atari 800 and Commodore 64, respectively, which he said represented the battle between the low-end manufacturers a year ago. Today, there was a different battle between the Amiga and the 520ST. Critics praised both machines but people were trying to figure out what to do with them. Was this another case of computer technology in search of a market?

Kildall said the Commodore 64 took us through the first generation of home computers, but now people were turning back towards VCRs and TV sets. So to get those consumers back, the second generation of home computers had to have higher resolution, color graphics, and better sound, which meant higher-performance processors and more memory. The Amiga and 520ST provided these capabilities, so now it was up to the software developers to make it happen.

Atari Makes Its Case at COMDEX

Wendy Woods opened her first report narrating B-roll footage of the recently concluded fall 1985 COMDEX show in Las Vegas. Woods said at the largest computer show of the year, Atari held court at one of the biggest booths on the floor, with the 520ST as the star. Nestled inside the Atari booth were dozens of software vendors, each with a sign and just enough space for a sign and a demo computer.

Woods said Atari seemed to have two goals: First, a highly visible presence at the show; and second, a message to dealers that this was one computer company that didn’t forget about software. From business to education to sophisticated graphics, the substance of Atari’s show was its extensive variety of software. Meanwhile, Woods said, the Commodore Amiga, was conspicuously absent from COMDEX. Commodore instead held private meetings with potential dealers in Las Vegas.

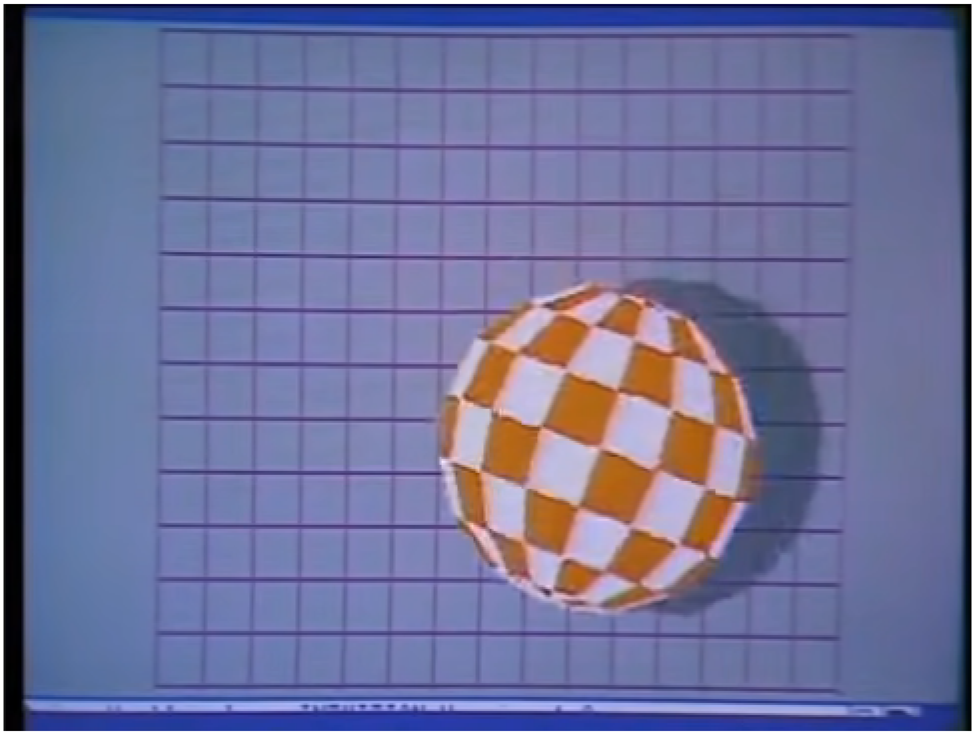
In spite of Commodore’s low-key sales pitch, Wood said Amiga had successfully wooed some unlikely dealers. Andrew Drexler, manager of The Computer Attic in Palo Alto, California, told Woods that he typically catered to business customers. So the Amiga represented a new focus for him on the home market.

Woods said the Amiga’s dazzling graphics and advanced hardware had also attracted equally sophisticated retail buyers. Drexler said it was about half-and-half between people who were anxious to have the “latest and greatest” machine and those interested in writing software for the Amiga. He added that a lot of developers were still holding off to see what the consumer response was before fully committing to writing software for the Amiga. But Drexler said that so far, the consumer response had been great.

The Graphical Power of the Amiga

The first round table segment focused on the Amiga. Commodore's Rick Geiger represented the hardware side as general manager of the Amiga division. Tim Mott, the vice president of product development for Electronic Arts, represented the software side.

Gary Kildall asked to go right into the demo of *Workbench*, the Amiga's graphical user interface. Geiger said there was also a command-line interface available for people already familiar with them. Geiger then showed off the famous "bouncing ball" demo, which showed off the Amiga's graphics and sound capabilities.



A 3-D model of soccer ball covered with a red-and-white checkered pattern bouncing against a blue background overlaid by a square grid.

Kildall was impressed by the demo. Cheifet asked Geiger to explain why it was impressive from a technical standpoint. Geiger said this was an example of synchronized, moving color graphics with sound playing at the same time. In addition, thanks to the Amiga's multitasking capabilities, there was still a separate word processor application running.

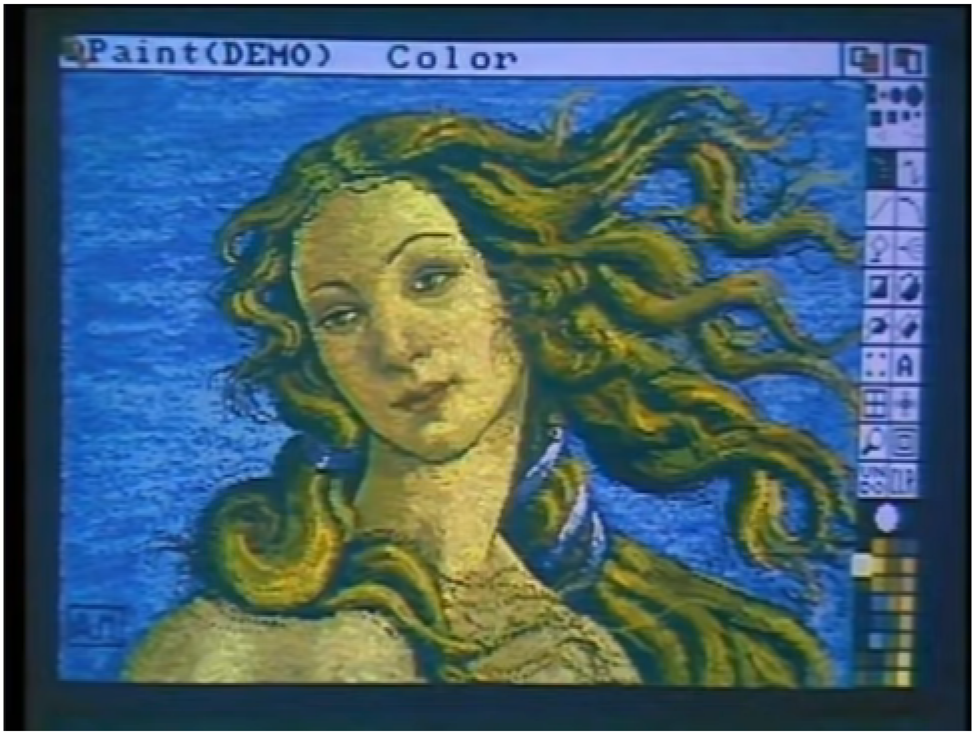
Kildall asked Geiger to go more into depth about the Amiga's graphics hardware. Geiger said there were 25 direct memory access (DMA) channels that provided all of the graphics rendering functions. This meant the graphics did not bog down the Motorola 68000 CPU. It also made it much easier to run multiple office applications at once.

Cheifet turned to Mott, noting that Electronic Arts was heavily invested in writing software for the Amiga. Why was EA so excited about the Amiga? Mott said that when EA started three years earlier, they envisioned a "home computer of the future" that would support much higher-quality audio-visual effects than was possible at the time. EA realized the technology would get to the point it wanted around the current time frame. When EA first saw the Amiga prototype about two years ago, it was clear that this was the machine that had the potential.

Mott, with assistance from Geiger, then showed off *Deluxe Paint*, an EA-developed painting program. Mott said this was the first in a series of creativity products for the Amiga. Mott said *Deluxe Paint* had enough features, and indeed was powerful enough, for a professional user. But it was also simple enough for home users to learn.

Cheifet asked about other upcoming programs in this creativity series. Mott said EA was working on a printing program to create banners, notices, and greeting cards; as well as a "deluxe" version of EA's existing *Music Construction Set* and a new *Video Construction Set*, which would let users produce video special effects.

Geirger pulled up several sample images that showed off *Deluxe Paint*'s abilities, including a rendering of Sandro Botticelli's painting *The Birth of Venus*. Mott noted this image was done by a professional graphic designer from scratch using the software.



A computer-painted image of a nude woman with long, flowing brown hair and standing against a blue background.

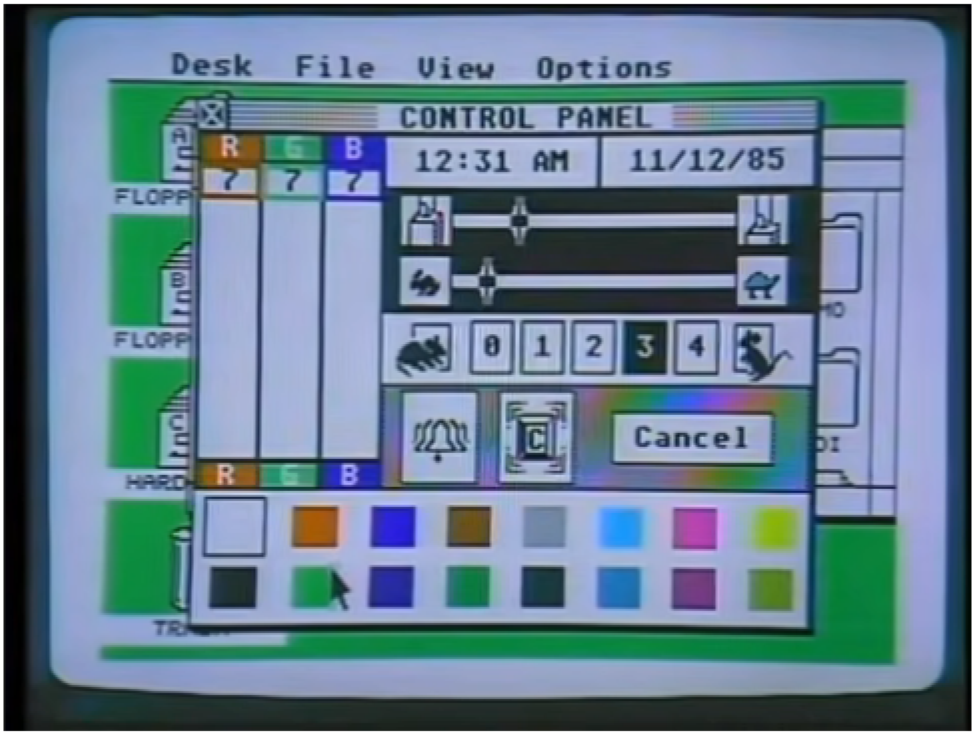
Another sample image showed a waterfall. Mott explained that by cycling color pallets, the Amiga could actually simulate the effect of the water moving.

Turning to practical concerns, Cheifet asked Geirger who he thought would buy the Amiga. Where did he see the machine being used? Geiger said that first and foremost, the Amiga was a powerful, general-purpose computer. On top of that, multitasking was built in from the beginning. He noted that users often expressed frustration over performance issues once they started using any sort of graphical interface or application. Thanks to the Amiga’s custom hardware, they’d been able to address those problems.

The Musical Power of the 520ST

Switching back to the Atari, Bryan Kerr and Jim Tittsler joined Cheifet and Kildall for the second round table. Both men worked for Atari Corporation, Kerr as the marketing manager and Tittsler as an engineer on the 520ST.

Kerr opened by demonstrating the 520ST, which he noted had been out on the market for about four months. He showed off the graphical user interface, which was based on the *GEM* desktop developed by Kildall's Digital Research. Specifically, Kerr demonstrated the GEM Control Panel (which looked a lot like the Macintosh Control Panel, albeit in color).

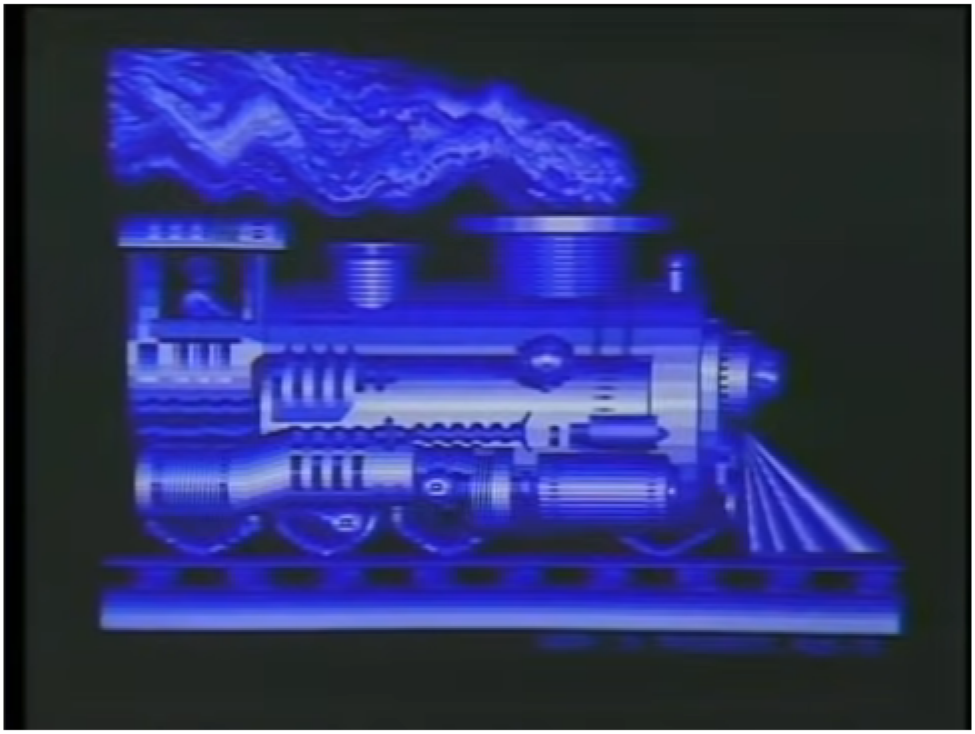


A box subdivided into multiple parts. On the top left there are red, green, and blue color sliders. On the top right there are sliders to control the response time of the keyboard and mouse. On the bottom there is a color palette selector with 16 colors.

Kerr next explained the sound features of the 520ST. He said there was a built-in MIDI interface. Tittsler elaborated that MIDI stood for the "musical instrument digital interface," an emerging industry standard that allowed a computer to sequence a series of notes going to a synthesizer. For this demonstration, the 520ST was connected to a synthesizer under the studio desk, which played a pre-recorded song. Tittsler added the interface could also be used to record an artist playing at the keyboard. It worked much like a word processor, he said, allowing you to edit the timing and notes.

Tittsler said the 520ST also had an internal, three-voice sound chip which could perform its own synthesis. But by building the MIDI interface into the machine, the user had the ability to spend as much on music as they liked. So if you were serious about music, that path for expansion was available.

Kerr turned back to graphics, using the 520ST to show a slideshow of images producing using an in-house Atari drawing package called *Neo*. (This program was also known as *NEOchrome*, which is how I'll refer to it.) Kerr said *NEOchrome* offered similar graphics capabilities to *Deluxe Paint*.



A computer-generated image of a steam locomotive on a railroad track, with a plume of smoke coming out of the train's stack.

Kildall noted these sample images were loaded directly from the 520ST's hard disk drive. Tittsler said that each sample image was 32,000 bytes. Kerr added this also showed off the machine's DMA port, which transmitted data at 10 MB/second, which was comparable to the local area networking speeds of many minicomputers. Kerr also showed that *NEOchrome* could do the same sort of waterfall movement by cycling color palettes as the Amiga's *DPaint*.

Kildall asked how much the 520ST cost. Kerr said the base configuration, including a black-and-white monitor with a resolution of 640-by-400 pixels and a single 3.5-inch floppy disk drive, retailed for a suggested price of $799.95. Kildall asked about the configuration that was actually on the desk, which included a color monitor, two floppy disk drives, and a hard disk drive. Kerr said you could get configurations "up to the $2,000 range." He said the ST with a color monitor started at $999.95. He couldn't price the hard disk configuration, since it wasn't on the market yet.

Kildall asked what it would take to actually get home users to buy the 520ST. Kerr said Atari considered the 520ST a "personal computer," and believed that "people determined what computers were used for," whether it was in the home or the office. (In other words, Atari didn't want to call this a "home computer.") He insisted that the 520ST was as powerful, if not more so, than any other PC on the marketplace. But yet it was priced at a consumer level–and that was the reason for buying the 520ST.

To demonstrate the potential business use of the 520ST, Tittsler pulled up a spreadsheet program called *VIP Professional*, which he said would be "shipping next week." Kerr added that it was a "Lotus work-alike," so it would recognize *Lotus 1-2-3* files but allow the user to take advantage of *VIP*'s integration with the GEM desktop's user interface.

Cheifet asked tongue-in-cheek if Kerr and Tittsler could show a bouncing red-and-white soccer ball demo like Rick Geirger did on the Amiga. They could and they did. Kildall joked this now seemed to be the standard demo. Kerr said it was a good example of graphics animation. Tittsler added that the 520ST featured four custom chips designed by Atari but the Motorola 68000 processor still did a lot of the work.

Finally, Kildall asked how many 520STs had actually been sold so far. Kerr said that as of the end of the third quarter, they had shipped 50,000 units. He added the computer was now available in over 30 countries.

Stoneware Betting on Atari's Low Prices

Wendy Woods presented her second remote segment, reporting from Stoneware, a software developer based in San Rafael, California. Woods opened by noting that whenever a new computer entered the market, software companies faced the tough choice of whether to write programs for it. In the case of Stoneware, which produced the database program *DB Master*–that meant choosing between the Amiga and the Atari 520ST.

Stoneware chose Atari. John Dickerson, Stoneware’s president, said the decision not to develop for the Amiga was due, in part, because it would have tied up too much of his budget for investing in other machines. The 520ST was much easier to develop for in that respect.

Woods said the success of *DB Master* on the ST, which would be marketed under the AtariSoft label, would depend on the success of the machine itself. But Stoneware believed the machine would sell. Dickerson said he certainly wouldn’t bet against Atari. Woods added that Stoneware had a history of taking risks, having written the first “serious” business software for the Apple II and the Macintosh, which turned out to be the right choice.

In the case of the 520ST, Stoneware expected the machine’s “revolutionary low price” would make it a best-seller. Woods added, however, that Stoneware still planned to eventually develop for the Amiga. But for now, they planned to produce more low-price products for the 520ST.

Would Emulation Make the Amiga More Attractive?

For the third and final round table, Lewis Moore and Tim Bajarin joined Cheifet and Kildall in the studio. Moore was president of Home Computing Centers, a small chain of California retail computer stores. Bajarin was a vice president with Creative Strategies, a market research firm.

Kildall opened by noting that Moore’s stores were selling both the 520ST and the Amiga. Given the range in price for different configurations of the ST discussed earlier by Bryan Kerr, what was the price for a comparable Amiga setup? Moore said the basic Amiga system was $1,295. But you needed to add a monitor, and to get the system memory up to 512 KB, that brought the price up to $1,895.

Kildall asked if customers saw the 520ST and Amiga as two different computers due to the price range. Were they comparing the two directly? Moore said that consumers were doing such comparisons, but he also believed that both systems would sell well.

Cheifet asked Moore what consumers actually said when they came into the store and compared the two computers side-by-side. Moore said there was a range of comments, such as that the Amiga had more features but it wasn't worth twice the price of the Atari. Other customers came in planning to buy a less-expensive system like the Commodore 128 but ended up purchasing the 520ST instead.

Cheifet asked Bajarin to explain what market these machines actually served. Were they just classy game machines? Were they business computers? Bajarin said with respect to Atari, the company's past history meant consumers were looking at it as more of a home gaming and entertainment product as opposed to a business machine. And while Commodore also had a strong background in the home market, the Amiga had more of a crossover possibility between the high-end home and small business market, especially given the Amiga's promised compatibility with the IBM PC through emulation.

Kildall asked Bajarin to elaborate further on emulation. Bajarin said based on demonstrations that he'd seen, it was software-based emulation that made the Motorola 68000 CPU believe it was an Intel 8088 CPU. Unfortunately, software-based emulation was very slow. Bajarin said he hoped that someday Commodore would introduce some form of hardware-based emulation.

Cheifet turned back to Moore and asked him how the Amiga and 520ST were positioned versus other machines on the market such as the Macintosh. Moore said he was seeing a lot of new buyers who hadn't purchased computers before and have been thinking about it. Now that the 520ST and Amiga were on the market, Moore said his stores were getting 20 to 30 calls a day from such potential customers.

Kildall asked Moore what customers were actually looking for when they came into the store to buy a computer. Moore said that at this early stage of the 520ST and Amiga's life cycles, you were mostly getting people who were enamored with the hardware itself–because there wasn't much you could do with the machines right now. Then there were people who were interested in the software that had been announced.

Cheifet ended by asking Bajarin if there would be enough software available for both of these machines. Bajarin said his firm's surveys found that software dealers were taking a "wait and see" approach. They saw the potential in both machines but also recognized both Commodore and Atari had "somewhat rocky" financial positions over the last year. So everyone was waiting to see if software channels would open at the start of 1986.

Was There Room for Two More Platforms?

George Morrow's closing commentary noted that both the Atari 520ST and the Commodore Amiga were linked to one of the "magic names" in the computer business–Jack Tramiel. Morrow said that at Commodore, and now Atari, Tramiel proved second only to IBM in the ability to establish *de facto* standards. And he was the major reason the press and public were willing to give both of these new machines a chance.

That said, Morrow cautioned that a computer was never more successful than the available software. While many existing programs could be ported to the Amiga and 520ST, that alone would not give customers enough reason to buy either. And given that there were already three major computer operating environments occupying software developers–MS-DOS, Macintosh, and the Apple II–it seemed unlikely the talent pool was expanding rapidly enough to support even one more operating system, much less two.

Desktop Publishing the Talk of COMDEX

Stewart Cheifet presented this week's "Random Access" segment, which was recorded in early December 1985.

- Several industry executives and analysts predicted price cuts across the software industry, from games to business packages. DataQuest noted there were approximately 27,000 software programs on the market, with a new product introduced an average of every 11 minutes.
- Cauzin Systems introduced a new product, the Softstrip, which encoded programs on paper barcodes, which could then be read by a scanner. Cuazin said 17 magazine and text publishers planned to include Softstrip programs in their publications. Cheifet said readers could then scan those programs directly into the computers.
- Desktop publishing was a major focus of the recent COMDEX show in Las Vegas. Cheifet said some vendors were showing complete "personal publishing systems" priced at under $10,000, as well as new laser printers priced at under $2,000.
- Also on the subject of desktop publishing, there were two new magazines dedicated to the subject: *Desktop Publishing* and *Personal Publishing*.
- Paul Schindler reviewed *Wizard of Wall Street* (MultiSoft, $45), a stock market simulator.
- RICOH introduced the Writeboard, an electronic blackboard (that was actually white). Cheifet said the Writeboard could save what was written on it to a computer.
- The United States, Canada, and Japan agreed to eliminate most tariffs on computer parts and peripherals. United States Trade Representative Clayton Yeutter said the agreement would lower U.S. costs and save the industry about $172 million per year.
- A major computer problem at the Bank of New York held up the delivery of $25 billion in U.S. government securities. Cheifet said the problem forced a large overnight loan from the Federal Reserve Bank and temporarily drove federal fund interest rates down.
- The 1986 Buick Riviera featured 10 different computer systems that took over the functions of 91 controls and gauges found on conventional cars. Cheifet said all computer controls were represented on a touch-sensitive computer screen, and service mechanics could plug the car's computer into their own computers to diagnose problems.

Tramiel's War Planning Under Fire

Gorge Morrow said Jack Tramiel's "magic name" would help drive public acceptance of the Atari 520ST. The reality wasn't so simple. Tramiel was famous for his mantra, "Business is war." But war isn't so easy to wage when you're outgunned and lack allies.

Atari's own 8-bit home computer line, which Tramiel inherited from Warner, was effectively dead by 1985. Meanwhile, both Commodore and Apple continued to sell their respective 8-bit machines in substantial numbers. In 1985 alone, Apple sold 900,000 machines from the Apple II series, and Commodore moved another 2.5 million C64 units, according to figures compiled in 2005 by Jeremy Reimer for *Ars Technica*. (I assume the Commodore figure also included some early Commodore 128 sales.) Although I argued that 1985 was the end of the Home Computer Era–at least in the sense that no new 8-bit 6502 machines entered the market–Apple and Commodore would remain in this segment of the market until the early 1990s.

Atari, however, really had nothing else to fall back on in 1985. There was a new video game console on-deck–the Atari 7800–but it was not released until May 1986 due to an ongoing battle between Tramiel and Warner Communications over who would pay the third-party firm that actually developed the machine. And by the time the 7800 did make it to market, Nintendo had already completed its successful launch of the NES.

Tramiel also had a long history of alienating business associates, which hampered his efforts to build support for the 520ST. Journalist John Markoff offered just one example in this October 1985 report:

> Several months ago, two software developers were meeting with an Atari Corp. official to hammer out what they thought would be the final details of a major contract.
>
> Suddenly, Atari Chairman Jack Tramiel marched into the room, announced his displeasure with the contract, picked it up and tore it in half. He then turned on his heel and left the room, leaving the developers sitting in stunned silence.

This was not an isolated outburst. Syndicated tech columnist Dan Gutman reported in May 1985 that a number of third-party developers decided against developing for the 520ST early on because of what they considered Tramiel's duplicity:

> When Tramiel announced the Atari ST in January, he gave a speech to the Software Publishers Association saying, "I need your help. I will give you support, technical or financial help."
>
> As it turns out, instead of supplying the software companies with advance samples of the ST, Atari has charged them each $4,500 to get one. Many companies refused the offer, preferring to sit back and see how the computer sells.

(Incidentally, Tramiel also charged the 45 developers who displayed their programs at Atari's COMDEX booth a $1,000 fee, a cost-saving move designed to recoup the costs of attending the show.)

Gutman said that many developers were skeptical that the 520ST would even be released. Of course, it did come out. But there were some unfulfilled promises, such as the CD-ROM drive I discussed in my last post on optical storage. Atari touted the prospect of a CD-ROM for the 520ST that never materialized due to cost concerns. This likely strained relations between Tramiel and Gary Kildall, as the latter had been counting on Atari's CD-ROM to help launch his new Activenture business.

Then again, Kildall's other company may have caused problems for Tramiel. The London *Guardian* reported on November 21, 1985, that *NEOchrome*, the drawing program featured in this episode, was essentially a last-minute replacement for *GEM Paint*, one of two programs that Digital Research reportedly failed to deliver to Atari, the other being a document editor called *GEM Write*.

There's also a bit of sad irony in that the one third-party Atari developer featured in this episode, Stoneware, was already on its last legs when the program aired in December 1985. Stoneware had actually filed for Chapter 11 bankruptcy back in April after a potential investor pulled out. The company closed for good in August 1986 when it was unable to pay or restructure its $1.7 million in debts, according to the *San Francisco Examiner*. John Dickerson told John Markoff that the company never recovered from its delay in releasing the original *DB Master*, which started as an Apple II program, for the IBM PC. Colorado-based Macon Systems, Inc., took over the marketing of *DB Master*, which was originally developed by another firm.

Did the Quest for Compatibility Kill Geiger's Commodore Career?

Meanwhile, Commodore already had the backing of a number of major software players when it came to the Amiga. In that same Dan Gutman column I quoted above, he said that just about every major software executive he spoke to had been praising the Amiga. In addition to EA's Trip Hawkins, Broderbund vice president Cathy Carlston gushed, "The Amiga is going to blow everyone's socks off." Another former *Chronicles* guest, *Pinball Construction Set* developer Bill Budge, said, "I know that everybody is developing for the Amiga. People are banking on that one. Nobody is developing for the Atari."

Obviously, Commodore still had its own problems and obstacles to contend with. As this episode addressed, it still wasn't entirely clear who was the target market for the Amiga. It was priced too high for the home market served by the older 8-bit machines. And business owners were by this time skeptical of any machine that didn't offer IBM PC compatibility.

Tim Bajarin mentioned the promise of such compatibility, but that turned out to be easier said than done. Sheldon Leemon reported on the state of the Amiga's early software-based emulation for *Creative Computing* after attending the Amiga's launch press conference in July 1985:

> When I inserted a Lotus 1-2-3 program disk, the program loaded normally. You could also say that it ran, but it might be more appropriate to say that it walked. The operation was said to take place at about 60% IBM speed, which looked about right. Also, it was not possible to operate the graphics section of the program, because the

> emulator, in its current primitive state, will run only programs that are compatible with the IBM monochrome adapter.

Jay Miner, a former Atari engineer who later led the Amiga's development, said in a 1992 interview that it was Rick Geiger who had pushed MS-DOS compatibility to satisfy his bosses at Commodore. (Amiga started out as an independent company that was later acquired by Commodore after Tramiel's departure as CEO.) Milner said an early attempt to produce an MS-DOS expansion card for the Amiga proved unsuccessful and led to Geiger's "downfall" at the company. However, Commodore's German subsidiary did release the Amiga Sidecar in 1986, which was basically an IBM PC XT clone that plugged into the side of the Amiga.

Going back to the issue of Amiga-native software, it's notable that EA's *Deluxe Paint* would end up becoming something of a "killer app" for the platform, more so than any of the early games that EA released, most of which were just dressed-up ports of the company's existing titles. *Deluxe Paint*–commonly known as *DPaint*–was basically an internal development tool that EA decided to turn into a product. It helped make the Amiga popular among other game developers. EA would continue to release new versions of *DPaint*, which was later expanded to MS-DOS computers, until 1995.

Notes from the Random Access File

- This episode is available at the Internet Archive and has an original broadcast date of December 3, 1985.
- Andrew Drexler owned and managed The Computer Attic in Palo Alto until 1995. Since then, he's worked as a mobile and web developer.
- Tim Mott was one of the original employees of Electronic Arts, although not technically a co-founder as Stewart Cheifet described him. Mott previously worked at Xerox PARC. In 1990, he left EA and became chairman and CEO of MacroMind Inc., an early multimedia company that later merged with Authorware Inc. to form Macromedia, Inc., which created the bane of Steve Jobs' existence, Flash. Mott continued to serve as chairman and CEO of the combined company

until 1993, when he effectively retired from the industry. Today, Mott owns Blue Farm Wines in Sonoma, California.

- According to the *New York Times*, Mott turned down an offer to serve as CEO of Kaleida, an early 1990s joint venture between IBM and Apple to develop multimedia products. That job ended up going to another former "Chronicles" guest, Nat Goldhaber.
- Bryan Kerr was among the few employees to survive the transition from the Warner Communications-owned Atari, Inc., to the Jack Tramiel-owned Atari Corporation. Kerr left his role as Atari's director of marketing sometime before the end of 1985 to join Blue Chip Electronics, a PC clone-maker based in Arizona. Three years later, Kerr co-founded his own company, Positive Corporation, which produced PC clones under the name Tandon. Kerr bounced around a number of different companies during the 1990s and early 2000s before starting another firm, GTILITY, Inc., which apparently focused on marketing sports video games to bars and restaurants.
- Like Kerr, Jim Tittsler was also a holdover from the old Atari. He ended up staying until 1991. Since the 1990s, he's lived in Japan and New Zealand, and most recently worked with the non-profit Open Education Resource Foundation.
- Tim Bajarin of Creative Strategies became a regular contributor to *Chronicles* going forward, and would occasionally sit in the co-host's chair after Gary Kildall's departure in 1990. Bajarin is still with Creative Strategies today, currently serving as its chairman.
- The company behind the 520ST spreadsheet program *VIP Professional*, VIP Technologies Corporation, apparently lived a short life. According to the California Secretary of State's office, the corporation was formed in May 1985 and suspended operations in May 1987.
- The "bouncing ball" demo seen in this episode was originally created by Robert J. Mical and Dale Luck for an Amiga prototype displayed at the 1984 Winter Consumer Electronics Show.
- The Cauzin Softstrip might be considered an ancestor of the QR code. Cauzin developed the technology under a joint venture with Eastman Kodak. The Softstrip never quite caught on, apparently due to the fact users needed a $200 reader attached to their computer to actually access printed programs.

- In 2015, Electronic Arts made the source code for the original *Deluxe Paint* available to the public for non-commercial use through the Computer History Museum.

Chapter 12: Reader Rabbit, Science Toolkit, A.G. Bear, and the Melard Access

This next *Computer Chronicles* episode launched the annual tradition of presenting a "buyers guide" for the holiday season. (It's referred to as a "Christmas Buyer's Guide" for this first installment.) These episodes would air each December for the duration of the series and typically featured panels composed of regular contributors.

Indeed, this first buyers guide had no in-studio guests aside from the three regular contributors from this third season: George Morrow, Paul Schindler, and Wendy Woods (who made her first on-set appearance). Woods presented one remote segment, but otherwise this episode simply had the hosts and contributors recommend technology-themed gifts to the viewers.

Would Christmas 1985 End the Computer Sales Slump?

Stewart Cheifet presented a brief cold open from a local computer store in San Mateo. This was followed with the customary studio introduction, where Cheifet and Gary Kildall looked at *Jingle Disk*, a Christmas-themed program released by ThoughtWare and running on an Apple IIe. Cheifet described it as the "ultimate hi-tech Christmas present for the hacker on your list."

Wendy Woods then presented her remote segment for the episode, narrating B-roll footage of a local shopping mall in San Mateo that was bustling with holiday shoppers, many of whom were looking to buy computers. Don Endy, a sales representative at the local Radio Shack store, told Woods that computers were selling well this year. He attributed the increase to price cuts for the top-of-the-line machines, which had taken away a little from the sales of less-expensive machines.

Woods said that while the range of affordable machines had expanded, different features appealed to different types of customers. For instance, a child was more interested in color graphics than a spreadsheet. So Christmas sales of low-end computers were brisk. But as the gap narrowed between home and office machines, all shoppers were getting smarter.

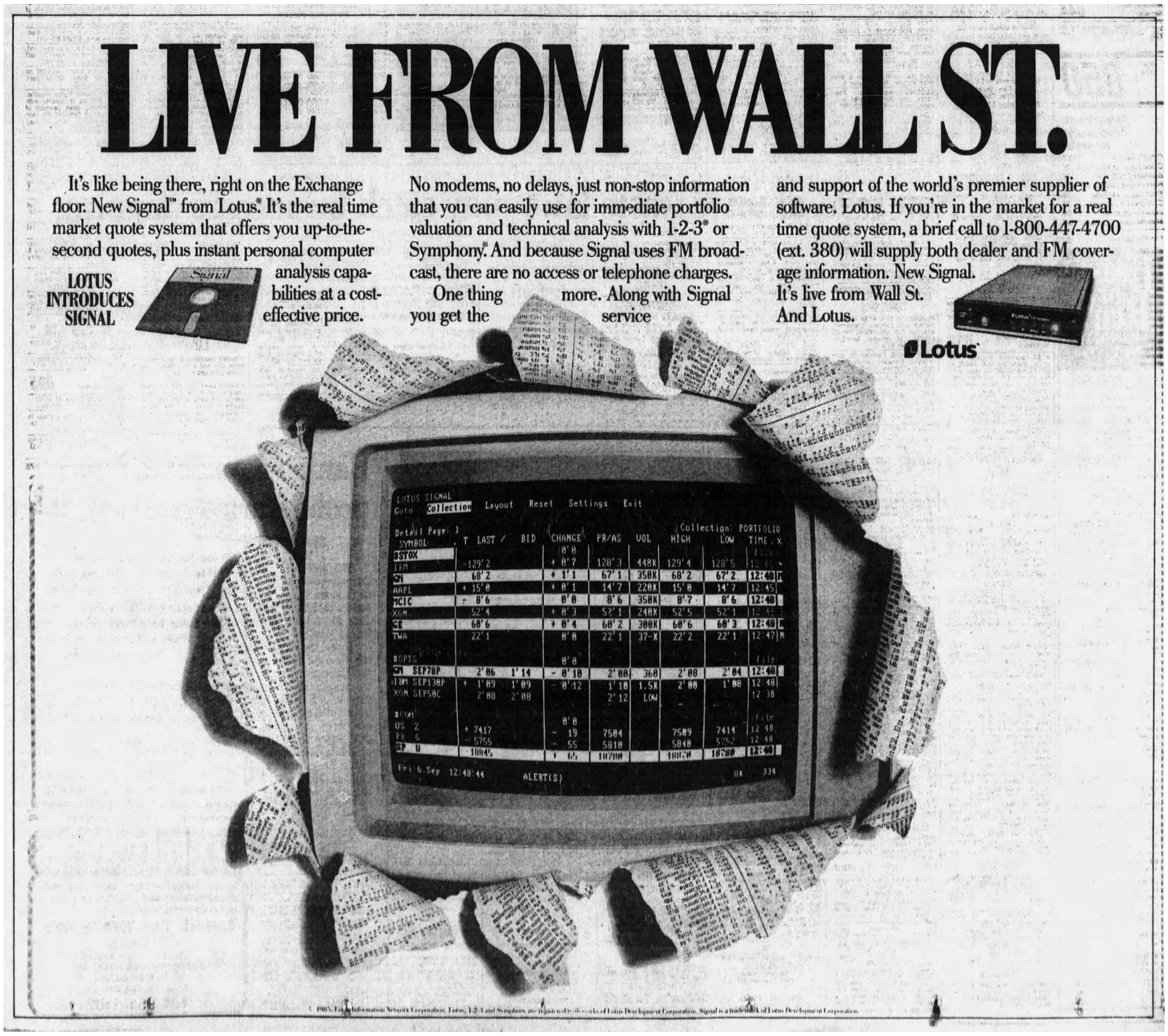
Jim DeWhitt, an assistant manager at a store called Computer Craft, said that customers had become more knowledgeable, which was helpful. They seemed to know what they wanted and had friends who owned computers and could give them advice.

Woods noted that computer sales were disappointing overall in 1985 and many computer stores had closed for good. But retailers were optimistic that computers would continue to excite the public. DeWhitt said he expected the holiday season to be the strongest part of the year in terms of sales. He wasn't deterred by the past year as far as any "slump" was concerned.

Using Your Apple II for Science!

George Morrow and Paul Schindler joined Cheifet and Kildall for the first round table. Given the departure from the usual episode format, I won't attempt a straight recap. Instead, I'll briefly run down the various products recommended by the panel.

- Cheifet opened by showing a program called *All About Hanukkah* published by Davka Corp. This was basically the Jewish holiday counterpart of the *Jingle Disk* seen earlier.
- Kildall recommended two computer books that he'd purchased for his own children: *Kids and the Commodore 64* by Edward H. Carlson and *Becoming a Mac Artist* by Vahé Guzelimian. Both books were published by *Compute!*, a well-known computer magazine of the time.
- Morrow recommended *Signal* from Lotus. This was a real-time stock quotation system offered by the makers of *Lotus 1-2-3* and used a combination of software and an FM radio receiver to receive information as opposed to a modem. (Below is a newspaper ad that ran for *Signal* around this time.)



LIVE FROM WALL ST.

It's like being there, right on the Exchange floor. New Signal™ from Lotus.® It's the real time market quote system that offers you up-to-the-second quotes, plus instant personal computer analysis capabilities at a cost-effective price.

LOTUS INTRODUCES SIGNAL

No modems, no delays, just non-stop information that you can easily use for immediate portfolio valuation and technical analysis with 1-2-3® or Symphony.® And because Signal uses FM broadcast, there are no access or telephone charges.

One thing more. Along with Signal you get the service and support of the world's premier supplier of software. Lotus. If you're in the market for a real time quote system, a brief call to 1-800-447-4700 (ext. 380) will supply both dealer and FM coverage information. New Signal.

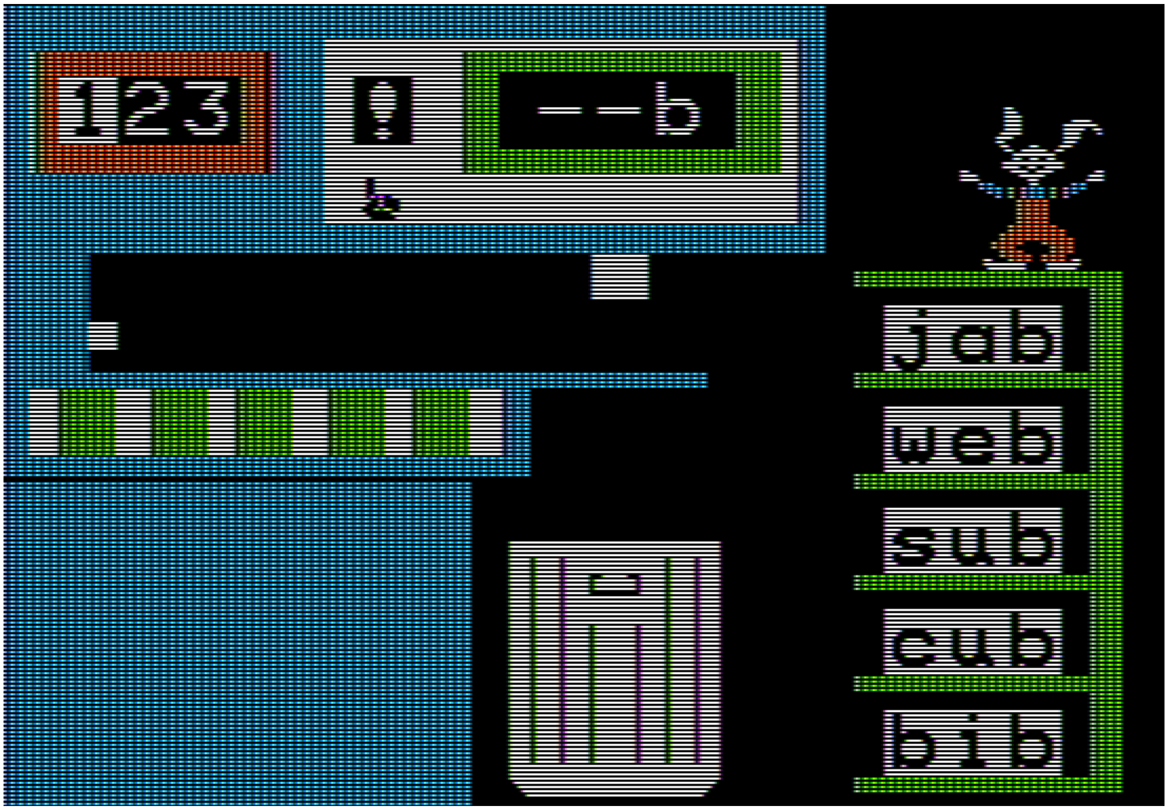
It's live from Wall St.
And Lotus.

Lotus

Ad copy: "It's like being there, right on the Exchange floor. New Signal from Lotus. It's the real-time market quote system that offers you up-to-the-second quotes, plus instant personal computer analysis capabilities at a cost-effective price. No modems, no delays, just non-stop information that you can easily use for immediate portfolio valuation and technical analysis with 1-2-3 or Symphony. And because Signal uses FM broadcast, there are no access or telephone charges. One thing more. Along with Signal you get the service and support of the world's premier supplier of software, Lotus."

Schindler recommended a number of products that he'd previously reviewed for "Random Access," including *Ultimate Trivia*, *Bakup*, and *Higgins*. He also gushed about *XyWrite*, a word processor published by XyQuest that he used in his own work. Schindler and Kildall then demonstrated *Reader Rabbit*, an educational software title published by The Learning Company, on an Apple IIe.

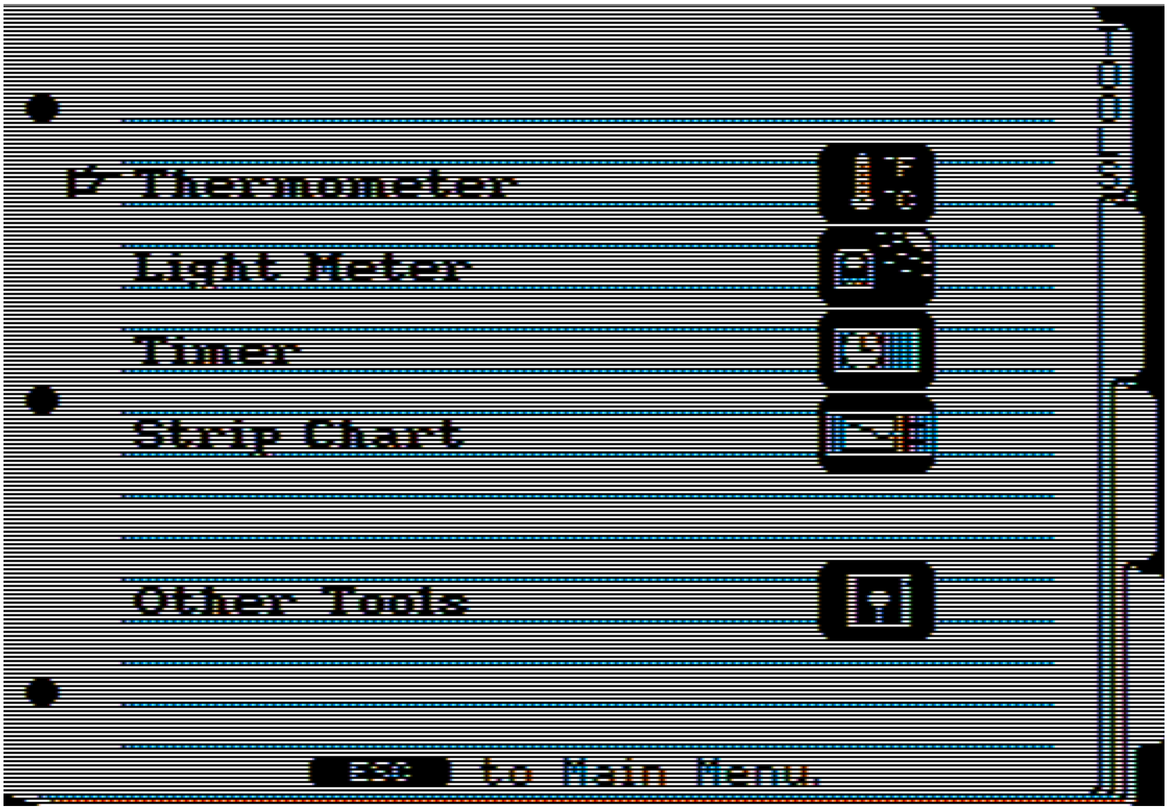
Reader Rabbit consisted of several mini-games designed to help young children learn how to read basic words. (I've recreated the demonstration below using an emulator.) In this mini-game, the child had to identify words that included a matching letter. The child–or in the on-air demo, Kildall–pressed the spacebar to let a word through if they thought it matched. Otherwise the word would "fall" into a garbage can at the bottom of the screen. If the child matched five words correctly, a dancing rabbit appeared.



A conveyor belt carries words from the left to the right of the screen. There is a trash can at the bottom of the screen. On the top there is the pattern "–b," meaning the player must match words ending in "b." On the right side is a stack of five words that match, jab, web, sub, cub, and bib. A white rabbit dressed in a blue shirt and orange overalls is dancing on top of the stack.

Cheifet closed the segment with another demo, this one for *Science Toolkit* by Brøderbund. This was a hardware-and-software package that enabled children to conduct basic science experiments using an Apple II. The *Toolkit* came with a photo-electric sensor and a thermometer that plugged into the Apple's joystick port. The software received measurements from these probes and presented real-time graphs. There was also a built-in stopwatch function to time experiments.

(Again, I've recreated the main menu from software via emulation below, although obviously I couldn't access the hardware.)



A menu listing five options: Thermometer, Light Meter, Timer, Strip Chart, and Other Tools. There is a small icon to the right of each option. On the bottom there is a prompt to hit the Escape key to return to the Main Menu.

Robotic Pets and a New Handheld Computer

Wendy Woods joined Cheifet, Kildall, and Morrow for the final segment. Woods brought with her two items produced by Axlon, a company started by Nolan Bushnell, the co-founder and former CEO of the original Atari, Inc.

The first item was A.G. Bear, a teddy bear with a voice-synthesis chip. The bear didn't "talk" so much as make gibberish sounds in response to human speech. And in fact, Woods had difficulty getting the bear she brought to stop making noise, as it could be heard throughout the rest of the segment.

The rest of the group presented their hardware recommendations for the season. Morrow endorsed the Epson Equity line of IBM PC compatibles. Kildall suggested buying a "lightweight" printer such as the Okidata 192.

Cheifet endorsed a "delightful little machine" called the Access from Melard Technologies. This was a small handheld computer with a 40-column, 8-row LCD screen. Cheifet said it was capable of creating 80-column documents using a built-in word processor. It also had a file search utility. Kildall asked if the Access could communicate with other machines. Cheifet said it had a modem port and an acoustic coupler, so you could use it with a pay telephone. Morrow noted the screen had excellent contrast. Cheifet added the Access came with removable cartridges that could be used for either RAM or ROM and the battery lasted about 10 hours.

A small hand-held computer sitting on a desk. The machine is flipped open, revealing a small LCD character display on top and a keyboard on the bottom.

Woods concluded the program by showing off her second Axlon toy, a pair of Petsters, which were simple robots that looked like cats. Like A.G. Bear, the Petsters responded to human speech or clapping. They made a "meow" sound and started moving around the table. (Cheifet jokingly asked if the two Petsters could mate.)

A pair of robotic toys that look like small cats. They are sitting on top of a desk.

Abandoned Adam a Surprise Holiday Seller

Stewart Cheifet presented this episode's "Random Access," which featured news stories from December 1985.

- December computer sales were looking good, not because of Christmas, but thanks to businesses motivated by year-end tax considerations. Home computer sales were projected to be down from 1984, while office computer sales would be up more than 30 percent.
- Cheifet said the "surprise hit" of the holiday season was the now-orphaned Coleco Adam, which was selling better than last year thanks to discounts.
- Microsoft was rumored to be coming out with a "generic" version of DOS 5.0, while IBM would have its own "superset" of DOS 5.0 that would take advantage of the PC-AT's 80286 microprocessor while maintaining compatibility with existing DOS software. Cheifet said the main features of the new DOS would include better graphics, addressing more than 640 KB of memory, multitasking, and connectivity with mainframes.
- Steve Wozniak was buying up Apple stock following the departure of Steve Jobs from the company. Wozniak reportedly bought $5 million in Apple shares and planned to purchase more in the future.

- Data General said it had a new "lap portable" computer that would include a built-in hard disk drive and an easy-to-read screen. Cheifet said the product was described as a "laptop XT."
- The Chairman of the U.S. House of Representatives Committee on Government Operations said the Social Security Administration's new computer system was a "mess," suffering from missed deadlines, cost overruns, and political problems. Cheifet said the new computers were now expected to cost nearly $1 billion, almost double the original estimate, and two former SSA officials had been found guilty of soliciting bribes in connection with software contracts.
- Paul Schindler reviewed *Rocky's Boots*, an educational game from The Learning Company ($50) that taught kids about electrical circuits.
- Reference Technology was selling a CD-ROM for the IBM PC with over 8,000 free programs–but you had to buy a $1,600 optical drive to run it.
- Borland International was reportedly buying up the electronic publishing rights to a variety of reference works, including *Barlett's*, the *Columbia Encyclopedia*, and *Black's Law Dictionary*.
- TW Technologies was now offering an $800 hard disk drive for the IBM PCjr.
- A new program called *Chuckle Pops* (Enlightened Software, $14.95) stored hundreds of jokes in a computer.
- Referencing an item I discussed in my last blog post, Atari Chairman Jack Tramiel profited at the recent Winter COMDEX show by subletting the company's booth to 45 software vendors who paid $1,000 each for the privilege.

Nolan Bushnell's Animatronic Fixation

Axlon was not the only company peddling technology-enhanced animal toys in 1985. According to a November 1985 report by Suzanne Dolezal of Knight-Ridder Newspapers, there were at least seven "animated" toys on the market that holiday season. In addition to A.G. Bear and the Petsters, there was Teddy Ruxpin and Gabby Bear, which both used a combination of animation and audio cassette playback; the Tattle Talk Monkey, which used a speech synthesis chip that could echo back a few words; and Chatter Animals, which produced "jungle-type sounds."

As mentioned in the episode, Axlon was started by Nolan Bushnell, best-known as the co-founder of the original Atari, Inc., not to be confused with Jack Tramiel's new Atari Corporation. Bushnell had long been interested in mechanical puppetry (i.e., animatronics). While a college student in the 1960s, he said he wanted to work for the Walt Disney Company as an "imagineer," one of the people who designed the company's theme park attractions, which often included animatronic figures.

Later at Atari, Bushnell started a restaurant called Pizza Time Theatre–better known as Chuck E. Cheese's–which combined a pizza parlor and video arcade with an animatronic musical show reminiscent of a Disney attraction. Warner Communications sold the rights to the restaurant concept back to Bushnell after it fired him from Atari in 1978. Bushnell would take Pizza Time Theatre public in 1981, but the company filed for bankruptcy in 1984. A rival chain, Showbiz Pizza Place, then bought Chuck E. Cheese's and the two companies merged its operations. (The combined company continues to operate restaurants today under the Chuck E. Cheese's name.)

While Chuck E. Cheese's was in the midst of its meteoric rise and fall, Bushnell also started a venture-capital group called Catalyst Technologies in 1981. Catalyst basically served as an "incubator" for tech startups, according to a 2017 article by Benj Edwards for *Fast Company*. Edwards said that at its height, Catalyst was home to as many as 20 different companies.

Axlon was one of those companies. Edwards said it was also "one of Bushnell's favorites." By 1986, Bushnell had "consolidated his business interests and personal attention" with Axlon and abandoned Catalyst Technologies altogether.

Axlon's toys, including A.G. Bear and the Petsters, were distributed by the toy giant Hasbro, Inc. Indeed, one former Axlon employee told *Polygon*'s Jeremy Parish in 2018 that Axlon was "really a Hasbro division."

Outside of A.G. Bear and the Petsters, Axlon's only other notable toy was, quite literally, a noxious product known as Breath Blasters. According to a 1989 retrospective in the *Boston Globe*:

> In 1987, Axlon Inc., a Silicon Valley company headed by Nolan Bushnell, founder of video pioneer Atari Inc., spent $70,000 developing Breath Blasters, dolls which when squeezed emitted odors reminiscent of vomit and other organic odors.
>
> By that Christmas, "everywhere that it got on the shelf it sold out in minutes," Bushnell boasts. "The problem was, several retailers decided they wouldn't sell it. When you'd first open the box, this bad smell would come

> out. They decided that someone would think a kid had thrown up on the box, or something."

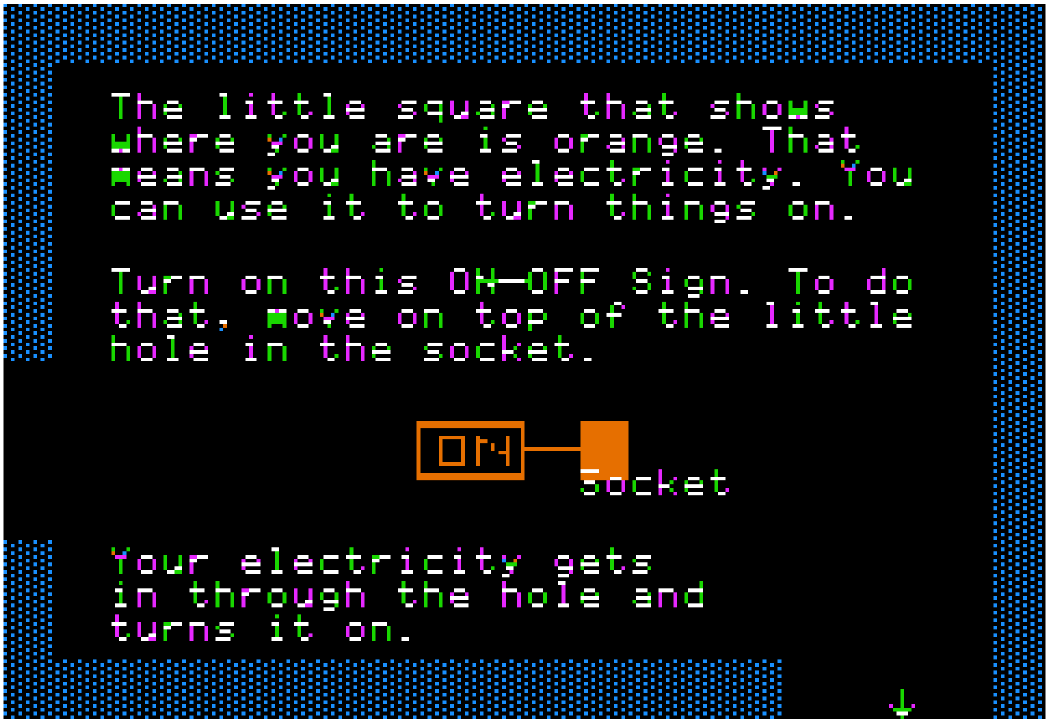
Axlon later tried to pivot back to Bushnell's old stomping ground, video games. In the early 1990s, Axlon developed two of the final games published by Atari Corporation for the original Atari 2600 console. Axlon also developed a never-released console called the NEMO for Hasbro, which was discussed at length in the previously mentioned *Polygon* article.

The details of Axlon's demise are somewhat murky. In a 1992 article for the *Tampa Tribune*, Bonnie Lamp Fowler said Axlon stopped making Petsters in 1987 and distributed its remaining stock to a San Jose-based company called Alltronics. Axlon's corporate filings with the State of California stopped in 1996. Benj Edwards and other sources have said that Axlon went public before being acquired by Hasbro. My guess is that Hasbro actually acquired whatever Axlon assets remained when Bushnell lost interest and decided to close up shop.

Ex-Atari Programmer Turned *Adventure* Model Into Edutainment

Another company featured prominently in this episode, The Learning Company, can also partially trace its lineage back to Atari, Inc. *Rocky's Boots*, the program reviewed by Paul Schindler in "Random Access," was designed by Warren Robinett, a former Atari programmer who developed three cartridges for the Atari 2600.

The most notable of Robinett's three Atari projects was *Adventure*, a loose graphical adaptation of the text-based game *Colossal Cave Adventure* that was popular on 1970s minicomputers. In *Adventure*, players controlled a square avatar that picked up objects and used them to complete tasks in a multi-screen game world. Robinett adopted this same model for *Rocky's Boots*, only instead of slaying dragons and unlocking castles, the player's goal was to construct electrical circuits and build machines. Robinett later said in an interview that *Rocky's Boots* "was originally intended to be an adventure game where you built machines to defeat the monsters," but the concept later "evolved in a different direction."



The little square that shows
where you are is orange. That
means you have electricity. You
can use it to turn things on.

Turn on this ON—OFF Sign. To do
that, move on top of the little
hole in the socket.

Your electricity gets
in through the hole and
turns it on.

A game screen from "Rocky's Boots." The text reads: "The little square that shows where you are is orange. That means you have electricity. You can use it to turn things on. Turn on this ON-OFF Sign. To do that, move on top of the little hole in the socket. Your electricity gets in through the hole and turns it on."

That different direction took Robinett from leaving Atari to joining Ann McCormick, a former nun and school teacher, and Teri Perl, a Stanford-trained Ph.D and educational psychologist, in forming Alternative Learning Technologies (ALT). Robinett started working on his revised concept for *Rocky's Boots* with ALT. When the game was finally released in 1982, ALT had changed its name to The Learning Company.

According to a 2018 profile of The Learning Company by Abigail Cain for *The Outline*, during the development of *Rocky's Boots*, McCormick hired another Stanford Ph.D, Leslie Grimm, to help Robinett part-time with the program. After joining The Learning Company full-time 1981, Grimm developed *Reader Rabbit*. Cain said the two programs put The Learning Company on the map:

> Inspired by the methods of a "particularly fine teacher" in a nearby school district who taught students with language disabilities, [Grimm] created a dancing digital rabbit to guide children on their way to literacy. *Reader Rabbit* was born, published in 1984 as one of the very first character-based

> software programs. It spawned more than 30 spin-offs, which together sold at least 14 million copies.
>
> Paired with *Rocky's Boots*, TLC had both a critical darling and a popular franchise. "It's not on people's wish list to get something that teaches their second grader logic gates," explained McCormick. "It's on their wish list that they learn to read. So *Reader Rabbit* was a much more popular product."

Perl, Grimm, and Robinett were also credited as the co-authors of *Gertrude's Secrets*, an educational puzzle game in the same style as *Rocky's Boots*. (*Secrets* was discussed in a previous *Chronicles* episode.) But as was often the case with 1980s software companies, The Learning Company took venture capital and its founders ended up leaving one-by-one in short order. Cain said that Robinett and Grimm were gone by 1985, Perl was fired, and McCormick was "pushed out" right around the time this *Chronicles* episode aired in December 1985.

Brøderbund Focused on Add-Ins and Add-Ons

I reviewed the early history of Brøderbund back in Part 41, where the main episode featured the company's *Dazzle Draw*. According to Lauren Elliott, the lead designer on *Science Toolkit*, the "inspiration" for that project came from Brøderbund boss Doug Carlston, who wanted to "create a hardware extension for the Apple, the kind of package that lets you conduct real-time experiments rather than on-screen simulations."

Science Toolkit also came at a time when Brøderbund liked to package its software with various physical add-ins. Most notably, there was *Where in the World is Carmen Sandiego?*, which came bundled with a copy of the *World Almanac*. Kate Willaert, a video game historian who probably knows more about Brøderbund than anyone, suggested to me this could have been a form of copy protection, as you couldn't effectively use the software without the add-ins.

Another Brøderbund trend from this period was selling separate add-on content for its existing software–what we would now call an "expansion pack" or DLC. *The Print Shop* was perhaps Brøderbund's most famous example of this, as you could buy a host of graphics libraries that provided additional clip art for the base program. Brøderbund sold at least three add-on modules for *Science Toolkit*. One of them was an "Earthquake Lab," which included a seismograph and plotter to measure wave movements in the ground.

Unlike other popular Brøderbund programs such as *Carmen Sandiego* and *Print Shop*, *Science Toolkit* was an Apple II exclusive. The original program–formally known as *The Science Toolkit Master Module*–retailed for $70, with the add-on modules priced at $40 each. Brøderbund also offered a special "School Edition" of the base program for an additional $20. In a December 2021 social media post, Willaert noted that *Science Toolkit* was a "mid-tier seller" for the company. It actually performed better in its first couple of months after release than even *Carmen Sandiego*, although the latter would eventually sell more than four times as many units and enjoy a much longer shelf life (not to mention multiple best-selling sequels).

Notes from the Random Access File

- This episode is available at the Internet Archive and has an original broadcast date of December 10, 1985.
- Melard Technologies, the New York-based company behind the Access handheld computer, was founded by Ali Sharif-Enami in 1982. During its 20-year history, Melard produced a variety of wireless computing devices, primarily for business and enterprise customers.
- A.G. Bear was designed by Ron Milner, who previously worked for Nolan Busnhell at Atari, Inc. (Milner had co-designed the Atari 2600.) Milner's Applied Design Labs later acquired the rights to manufacture and sell a limited number of new A.G. Bears and replacement parts.
- The Coleco Adam originally retailed for $750 when it launched in 1983. According to newspaper advertisements I found from December 1985, retailers had slashed the price to just under $300. And that was for a computer with a printer! (The printer was not optional; it contained the Adam's power supply.)
- I think Stewart misspoke when he talked about the rumors surrounding "DOS 5.0." In 1985 the current version of DOS was 3.1. There would not be a MS-DOS 5.0 release until 1991.
- Data General did release its successor to the Data General/One–confusingly named the Data General/One Model 2–in May 1986. It did offer a built-in 10 MB hard drive, but it would set you back $4,635, according to *InfoWorld*. The base model with a single floppy drive only cost about $1,800.
- The ultimate fates of both The Learning Company and Brøderbund will converge in the 1990s, but I'll get to that later. If you can't wait, Abigail Cain's article provided an excellent overview of that part of the story.

Chapter 13: The Hardcard, Masterflight 60/60, Hyperdrive, and the Bernoulli Box

As we close out 1985 on *Computer Chronicles*, the discussion returned to a familiar subject–storage devices. This next episode looked at hard disk storage specifically. Keep in mind, hard disks were still not considered standard equipment at this time. The Macintosh, for example, did not come with a hard drive. And while you could purchase an IBM PC-AT with a 30 MB internal drive, many users still had to make an aftermarket purchase to acquire a hard disk, which could run over $1,000. Even at the lower end, you would still pay several hundred dollars for a device that stored a total of 60 MB.

Were Hard Drives Reliable?

Stewart Cheifet introduced the episode standing in front of an unidentified “mass storage device” from the old days–a 40-inch hard disk drive that held about 10 MB.

A man in a suit standing in front of a large, 1950s-era hard disk unit, which comes up to his waist.

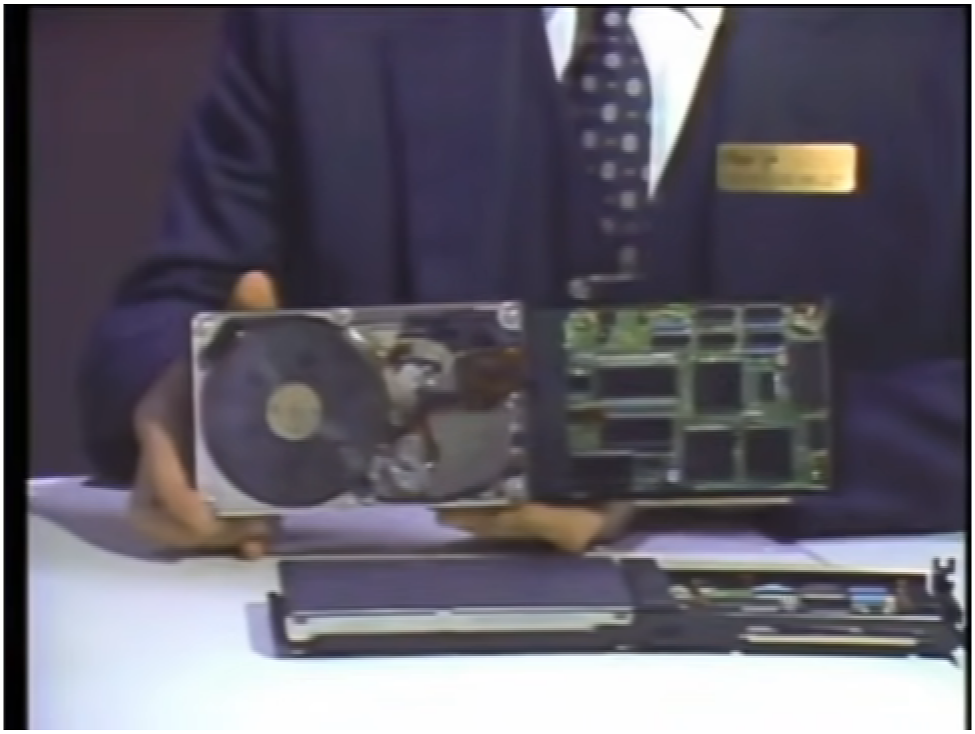
In the studio, Cheifet showed Gary Kildall two RAM cards–an AST Technologies Six-Pack Plus (380 KB) and Intel's Above Board (2 MB)–that were being marketed as mass storage alternatives to hard drives. Did that suggest there were still problems with hard disk drives? Kildall said the hard drive and the RAM card represented two different phenomena. The RAM card was an attempt to expand the limited amount of memory available in a 16-bit machine, a problem that would likely go away as the market shifted to 32-bit machines with "unconstrained" memory address space. With a hard disk, the issues had to do with the fact that it was a mechanical device subject to problems such as head crashes. So it was critical to backup data to protect against such crashes when they did occur.

Adding a Hard Disk with a Single Board

Wendy Woods presented the first of three remote segments. This first report looked at the Hardcard by Plus Development, a hard disk-on-a-card for the IBM PC and compatibles. Woods said that while hard disks were once limited to "mainframe monsters," they were now a desirable addition for

PC owners. Early disk platters had shrunk from 12 inches to 5 inches–and now to 3.5 inches in diameter. This made hard disks small enough to fit completely on a single PC board.

Stephen Berkley, the president of Plus Development, told Woods that the Hardcard was the first hard disk subsystem designed to be installed by the end-user. Up until now, he said disk drives were sold to the system manufacturers, who then performed a technical installation. With Hardcard, any user could install it in about 10 minutes. Berkley added the Hardcard was an “extremely reliable” product due to a lower parts count, as Plus Development designed both the mechanical and electronic components together.



A man in a suit holding a hard disk drive mounted to a circuit board. The unit is designed to be inserted into an expansion slot on an IBM PC or compatible machine.

Woods noted that sluggish sales of personal computers had led to business failures and pessimistic predictions. But vendors of add-on peripherals like the Hardcard saw the slowdown as an opportunity. Berkley said corporations in 1985 were not buying PCs in the quantities they used to, because they’d already bought millions of machines over the past three years. Now the focus was on improving the productivity of that earlier investment. In that respect, he saw the Hardcard as a natural purchase.

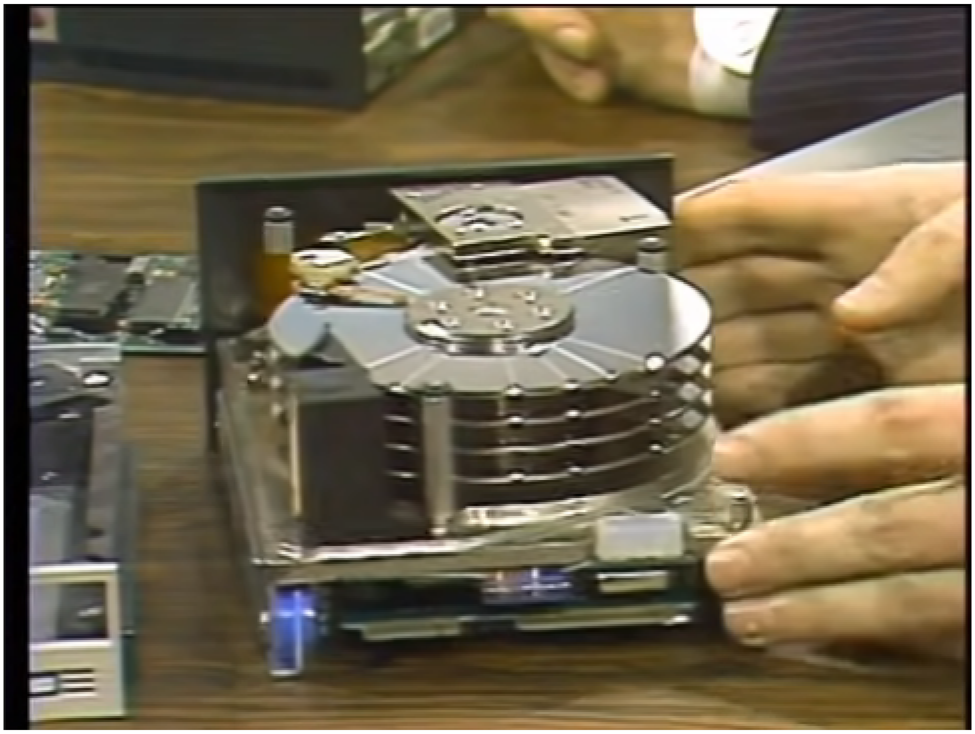
Woods said that paradoxically, as computer parts became smaller, users concurrently expected better performance and cheaper prices. But the trend toward smaller formats didn’t always exclude multiple standards. Berkley said there would be multiple standards as there had always been with traditional “Winchester” hard drives. For example, some manufacturers still use 14-inch or 8-inch media. The current 5.25-inch drives were now able to support 100 MB and 200 MB of storage. He expected similar increases in capacity over time from the more recent 3.5-inch hard drives. The next question was would there be a sub-three-inch disk.

When Would a Consumer Need 60 MB of Storage?

For the first round table, Alan Ebright and Joel Kamerman joined Cheifet and Kildall in the studio. Ebright was a development manager with San Jose-based Prima Corporation, a hard disk drive manufacturer. Kamerman was CEO of Oregon-based Kamerman Labs, which produced an external disk drive called the Masterflight 6060.

Kildall asked Ebright for a general explanation of hard disk technology. Ebright said that the IBM PC/XT currently shipped with a 10 MB hard drive as a standard. In the higher-performance PC-AT, the standard disk drive was 20 MB with an optional 30 MB disk. There were also add-in disks that could be placed inside the XT or AT. Ebright showed an example of such a disk produced by Priam, which was a 60 MB drive.

Ebright removed the cover to show the inside of the unit, which he explained a user should never do as it ruined the drive.



A hard disk drive with the cover removed. You can see four dish platters mounted to the inside of the unit.

He explained the drive was an electro-mechanical device composed of four disk platters mounted on a hub turned by a motor. A read-write head then moved across the surface of the disk to access information. The arm was moved by a rotary voice coil motor. There was also a filter that pumped air into the head-disk assembly as it moved. This filter helped maintain a clean environment inside the disk.

Kildall clarified that the head did not not make contact with the disk platter, but instead floated on top of a cushion of air. Ebright said what actually happened was that as the disks were turned, they pulled air along with them in the cavity. This air was forced in between the head and the disk surface and built an air-bearing such that the head-to-disk difference was very closely controlled.

Cheifet noted that the main concern with hard disks was that they were considered “delicate, fragile things,” i.e., you couldn’t bang them and so forth. How delicate were the disks in practice? Ebright said hard disks were a precision, electro-mechanical instrument and they should be treated with care. But you would also treat your computer with care. You wouldn't drop a CRT monitor, for example. As for Priam's hard disk drive, it came with shock mounts that helped to minimize any impacts.

Kildall then turned to Kamerman, whose company made an add-on external hard disk drive. Kamerman said the unit he brought with him, the Masterflight 6060, contained two 30 MB hard drives and a 60 MB tape backup system. There was also built-in power direction to control access to other peripherals, and a lock and key to restrict access to the disk itself.

A large rectangular box with the top cover removed. Inside there are two hard disk drives and a tape backup drive.

Kildall asked about the tape backup, specifically how long it took to make a copy of the hard disks. Kamerman said that it took about 2.5 minutes to backup 10 MB. Doing the math, Cheifet added that it would therefore take about 15 minutes to backup the entire 60 MB system, assuming the disks were full.

Kildall asked about the price difference between an external system like the Masterflight and an internal hard disk such as the Priam unit. Kamerman said prices ranged from about $399 for an internal system up to $6,000 for an external unit.

Cheifet asked Ebright what kind of user actually needed 60 MB of storage. When should a consumer think about needing that amount of storage? Ebright said the most common application for high-end, high-performance disk drives was in high-end computers. So it was more likely that an AT user would use a 60 MB disk versus someone using an XT. Along with the added storage capacity, he said Priam’s hard disk offered better access times. You could get to the data quicker. And when you had more data, getting to it faster was generally a requirement.

Kildall said it was then a matter of better “seek times.” Ebright said such times were generally quoted over the capacity of the drive, so you had to look at the average access time based on the size of the drive. In other words, you couldn’t directly compare the seek times on a 10 MB and a 60 MB drive.

Cheifet returned to the issue of backup times, noting that even 15 minutes was a bit long. He asked if we were developing better backup technologies than “streamers” (i.e., tape drives). Ebright said streamers were still considered more cost-effective for large-capacity backup. He actually thought backing up 60 MB in 12 to 15 minutes was actually pretty good performance–especially if you compared it to backing up on a floppy disk.

Apple Allowed Installation of Third-Party Hard Drive in Macs

Wendy Woods’ second report focused on the Hyperdrive, an internal hard disk add-on for the Macintosh. Woods said Mac owners were “raving” about the product. She said the Hyperdrive increased the Mac’s speed by a factor of three, added 10-20 MB of internal storage and enabled the machine to run multiple programs simultaneously.

Mark Wozniak, the brother of Apple co-founder Steve Wozniak and the general manager of the retailer Computer Plus, said the Hyperdrive was popular among his customers. They sold at least one Hyperdrive for every

Mac sold. He said the Hyperdrive was a “fantastic” unit and he couldn’t imagine working on a Macintosh without one.

Woods then showed a demonstration of two Macintoshes running side-by-side, one with a Hyperdrive and one without. She said you couldn’t underestimate the importance of the Hyperdrive to the Macintosh–not only because it’s expanded the computer’s capabilities, but also because it helped the machine to gain acceptance in the business community, according to Kevin Curran, the president of General Computer Corporation, which produced the Hyperdrive.

Curran told Woods that Hyperdrive had gained acceptance within a number of Fortune 1000 companies. And major firms like Eastman Kodak, AT&T, and GE were now buying Macs with Hyperdrives to assess their potential as IBM PC replacements.

Woods said one of Hyperdrive’s biggest selling points came from Apple itself. The company said installation of a Hyperdrive by a technician–a process that took about an hour–would not void the Macintosh’s warranty. This was the first time that Apple had given a third-party vendor’s product that kind of endorsement. Woods said it was a testimony to the Hyperdrive’s success and utility.

Were Cartridge-Based Disks the Answer?

Wendy Woods’ third and final report took us back to the November 1985 COMDEX show for a demonstration of the Bernoulli Box, a hard drive alternative produced by Iomega Corporation. Woods explained the Bernoulli Box relied on magnetic storage disks in removable cartridges. Scott McVay, Iomega’s vice president of marketing, explained the Bernoulli Box used a 200-year-old principle developed by Swiss mathematician and physicist Daniel Bernoulli.

McVay said the Bernoulli Box worked with 10 MB and 20 MB removable cartridges. This allowed users to share mass databases among multiple sites within an office. He added that the cartridge used a flexible diskette but was very rugged. It could tolerate the abuse typical of most office environments.

The cartridges could also be mailed across the country without any special protection.

Woods added that the Bernoulli Box featured an “unorthodox” read-write head meant to overcome the hard disk’s most disturbing quirk–the head crash. McVay said the Bernoulli Box was immune from such crashes because the device actually removed air from the disk media and the head to maintain contact. A traditional Winchester hard disk, in contrast, forced air into the drive to separate the head from the media. If the Bernoulli Box lost power, it lost the head-disk interface as well. The Bernoulli effect then caused the disk media to “fly away from” the head.

Woods said the potentially infinite capacity of a cartridge-based system was one answer to the expanding taste for more and more data storage, but it came at a price. The Bernoulli Box was approximately three times as expensive as a low-end hard disk. And storing files on multiple cartridges meant switching them back and forth like floppies.

Finally, Woods noted that optical discs could present a serious challenge, offering 50 times the storage of one 10 MB magnetic disk. As if to please everyone, she added, Iomega and Reference Technology, Inc., showed off a combined CD-ROM and magnetic storage system. McVay said the dynamics of data could be best managed by the Bernoulli cartridge. But the CD-ROM played into a different application, and the two brought together provided an amplified capability of what either could do separately.

When Would Hard Disks Come Down in Price?

Back in the studio, Robert E. Brown joined Cheifet and Kildall. Brown was the president of Landmark Software and the author of the book *More Than You Ever Wanted to Know – about Hard Disks for the IBM PC*. Alan Ebright also remained with the panel.

Kildall asked if hard drives were really taking over the minicomputer market. Brown said that was the way things were going. Kildall followed up, asking what kind of applications were being used with a hard disk.

Brown said database applications required a tremendous amount of space. Program developers also had an “insatiable” appetite for disk space.

Kildall asked if a programmer really needed 60 MB of storage. Brown said it was much more convenient to have all the information you needed on one disk rather than switching floppy disks.

Kildall turned to Ebright and asked what consumer applications he saw for the hard disk. Ebright said you were able to do new things because of the new disks. You had more space available and you get to the data in that storage more rapidly. More specifically, he noted that system applications were migrating from large computers down into the personal computer environment. A person doing cash management, for instance, could have programs online at their desk to do analysis without going to a large mainframe or time sharing system. (Kildall added that these applications traditionally required something like a DEC VAX-11/750 minicomputer.) Ebright said that as hard disk storage made “super” microcomputers more powerful, the mainframes and minicomputers would have to step up as well to protect their share of the market.

Kildall asked if a home user would be interested in a 70 MB hard drive. Ebright said probably not. Brown added that anyone without that caliber of drive had some sort of business use.

Cheifet asked Brown where we were heading in terms of hard disk technology. Brown said there was really no limit. The rate of change depended a lot on IBM. When IBM was selling 10 MB drives on the XT, that was the standard size. Now that IBM was selling 20 MB and 30 MB drives with the AT, that was now the new standard.

Kildall asked about optical storage. How would that affect the hard disk market? Brown said that optical storage would become a wonderful backup medium in certain applications. But it was still a couple years away in coming down to a price that the typical business user would pay. And the performance of optical storage did not appear to be as good as today’s hard disk drives. Kildall suggested the optical disc could eventually replace tape streamers as a backup technology, and Brown agreed. Ebright added that an optical disc was also ideal for distributing large databases. And as users wanted to manipulate the data on a database, that would drive them towards purchasing larger internal hard drives where they could transfer that information from an optical disc.

Cheifet asked Ebright what could actually be done to add more storage capacity to a hard disk. Ebright said that in addition to adding more disk platters you could increase the track density, i.e., the number of tracks across the surface. You could also increase the number of bits around the surface and the efficiency of the encoding method.

Kildall said consumers were already concerned about the reliability of hard disks and now Ebright was talking about packing the data in even tighter. Should consumers be worried about more reliability problems in the future? Ebright said that higher-performance, higher-density drives would actually allow manufacturers to pack better technology into the units. Higher capacity would essentially force better design and quality.

Kildall asked how many hours an internal hard disk was expected to last on a typical AT machine. Ebright said 15,000 hours was the quoted specification for his company's drives.

Finally, Cheifet asked Brown if the prices for hard disk drives would fall as they'd already done for floppy drives. Brown said prices had already come down tremendously. A year earlier (1984), a 10 MB drive sold for $1,000. Now, you could find 10 MB systems for as low as $395.

Appreciating Hard Disk Designers

George Morrow's closing commentary noted that like freeways and money, disk space was a resource that tended to be consumed as fast as it was created. The computer industry had come to expect that memory density would quadruple every two years–a whopping amount compared to money and freeways. For semiconductor manufacturers, this meant smaller geometries and larger, defect-free crystals. But for hard disk drive designers, it meant getting four times as much performance out of the "treacherous" world of magnetic flux. It meant even finer track densities and having to access those tracks with tricky electro-mechanical devices (and their associated problems). Morrow said it was important to appreciate the fantastic work of hard disk developers, whose work consumers had come to take for granted.

Apple Moved Ahead with Mac Plus as Japan's "Fifth Generation" Stalled

Stewart Cheifet presented this week's "Random Access," which was recorded in December 1985.

- Apple planned to unveil an upgraded version of the Macintosh next month. The "Mac Plus" would feature 1 MB of memory, a double-density 800 KB disk drive, an expanded keyboard and greater speed. There would also be a SCSI interface to make it easier to connect third-party peripherals.
- IBM was reportedly planning to cut prices for the PC-AT by 20 percent due to excess inventory and softening demand.
- AT&T said it was starting to manufacture thin-screen plasma displays for portable computers. The AT&T display was one-inch thick and weighed four pounds. Cheifet said AT&T claimed its new display could be viewed under all lighting conditions and within a 150-degree viewing range.
- Digital Equipment Corporation announced its newest, fastest, and most expensive 32-bit "supermini," the VAX 8650. DEC said the machine could run 6 million instructions per second and cost $500,000.
- Workers at Hewlett-Packard factories in California and Oregon were headed back to full-time work after months of reduced work schedules. But those same workers would also receive a 5 percent wage cut.
- Paul Schindler reviewed *Golden Oldies* (Software Country, $35), a compilation of four "classic" computer games: *Pong*, *ELIZA*, *Conway's Game of Life*, and *Colossal Cave Adventure*.
- A U.S. Senate subcommittee heard conflicting testimony from computer scientists about the Reagan administration's "Star Wars" defense program. Scientists from the University of Southern California and Bell Labs told the subcommittee that the technology already existed to support the program. But other scientists said the necessary

software could never be debugged, since it could never be tested under real battle conditions. One expert also cautioned that the U.S. would be extremely vulnerable to espionage with respect to the software code.

- A Japanese report on the Fifth Generation computer project said progress was slow and the research might not bear fruit until the late 1990s.
- British scientists said they were making progress on their own fifth-generation project using what they called a “functional logic language” and “transputers.” The British said they would have a machine up and running by 1988.
- The world’s first ballet for humans and robots took place in Palo Alto, California. The original ballet called “Invisible Cities” featured nine dancers and a robot developed at Stanford. The choreographer said the robot performed “perfectly.”

Iomega Riding High in ’85

Perhaps the two most recognizable companies from this episode were Iomega and General Computer Corporation. Iomega is less remembered today for the Bernoulli Box than its later cartridge-based storage medium, the Zip disk, which the company introduced in late 1994. Meanwhile, General Computer Corporation famously started out in video games and later evolved into a printer company.

Iomega started in 1980. Its three founders–David G. Norton, David L. Bailey, and Roderick J. Linton–were ex-IBM engineers who went out and got themselves some venture capital funding to start a data storage company. Although the founders were originally based in Tucson, Arizona, they quickly relocated Iomega to Utah, where the company remained until moving to San Diego in 2001.

Heading into 1985, Iomega was on an upward trajectory. A July 1985 report from Associated Press writer Bob Kuesterman said Iomega reported a $2.52 million profit in 1984. That may not sound like much but it was a significant improvement after suffering $20 million in losses the previous year.

By this point the original founders had largely been pushed out in favor of new management. Gabriel P. Fusco, who took over from Bailey as president, decided to shift Iomega's focus from marketing to computer manufacturers and towards direct-to-customer sales. The Bernoulli Box was meant to fill a gap left by IBM and the clone-makers, as these manufacturers did not offer a "high-capacity removable disk," Kuesterman noted in his report.

Even at an initial retail price of $2,700, the Bernoulli Box proved successful within a certain niche of customers. Iomega reported $5.1 million in profits for 1985 and record sales of $126 million during 1986. Things would head downward after that, but I'll get to that some other time.

GCC's Post-Video Game Crash Transition to Mac Peripherals

General Computer Corporation (GCC) started in 1981. As I mentioned, GCC's early claim to fame came in video games. The company's founders were (mostly) a bunch of MIT dropouts, including CEO Kevin Curran, who developed modified versions of the-popular arcade games such as Atari's *Missile Command* and Namco's *Pac-Man*. The former prompted a lawsuit from Atari, then still owned by Warner Communications, over alleged copyright and trademark infringement.

Atari ultimately decided to abandon the lawsuit and offered the GCC folks a payoff to simply go away. According to an oral history prepared by Benj Edwards in 2017, the deal called for Atari to pay GCC $50,000 per month for a period of two years. On paper, this was supposed to be a contract for GCC to develop games for Atari. But in practice, one of the GCC founders told Edwards that Atari "just wanted us to go sit on the beach, or go back to school, and never wanted to see us again."

GCC, however, decided to actually develop games for Atari. In fact, Edwards noted GCC would "would go on to design several arcade games and an entire new home console (the 7800) for Atari over the next several years." I referenced the latter a couple of episodes back, as the 7800's release was delayed when Warner Communications and the new Atari

Corporation under Jack Tramiel got into a pissing match over who would pay GCC for its work.

But GCC's most remembered contribution to the gaming world was its modification of *Pac-Man*, which eventually became *Ms. Pac-Man*. Atari said it was okay for GCC to sell its "conversion kit" for *Pac-Man*, provided it got permission from Midway, which was Namco's U.S. distributor. After Kevin Curran and his colleagues presented their modification–which was developed under the name *Crazy Otto*–Namco not only blessed the project but decided to make it the official sequel to the original *Pac-Man*.

The video game market, of course, took a major nosedive in the mid-1980s. The collapse of Atari, Inc., in 1984 brought down the home console market. The arcade market also sustained its own separate downturn during this period.

Curran apparently saw the writing on the wall and by 1984 had decided to pivot GCC into designing peripherals for the newest hot tech product, Apple's Macintosh. In addition to the HyperDrive, GCC also developed the Personal Laser Printer for the Macintosh. This helped re-launch General Computer Corporation–renamed GCC Technologies, Inc. in 1990–as a laser printer manufacturer. This would basically remain GCC's main product line until June 2015, when Curran decided to dissolve the company.

Berkley Took Quantum Leap Following Bushnell's Suggestion

Stephen Berkley's Plus Development was actually a subsidiary of Quantum Corporation, which started in 1980. It turned out that a chance discussion between Quantum's president, James Patterson, and our old friend, Atari co-founder Nolan Bushnell, indirectly spurred the creation of Plus Development and its Hardcard. According to an August 1985 column by C.W. Miranker for the *San Francisco Examiner*:

> One June night at a dinner in San Francisco, Bushnell "metioned that if he had low-cost disk-drives on a board he could use thousands," Patterson said. "That got me thinking… We (at Quantum) spent months talking about it."

> “But with the day-to-day pressures, there was no clear way to get the project going. It became clear, if we were ever going to do anything about it, we would have to set a group of people aside.”
>
> In October 1983, Quantum created a majority-owned subsidiary, rented a separate office and gave a handful of people three months to map out a business plan.

This subsidiary–Plus Development–was initially funded with $15 million and released the first Hardcard in October 1985. Although many imitators soon flooded the market with similar hard disks-on-a-card, Plus continued to produce variations of its own product up until 1992.

The Hardcard proved so successful that when parent company Quantum struggled in 1986 with its own 3.5-inch disk drive business, the board decided to replace Patterson with Berkley. Berkley served as CEO until 1992 and remained chairman until 2003. In 1993, Quantum absorbed Plus Development, at which point the latter ceased to exist as an independent company.

Another guest from this episode, Joel Kamerman of Kamerman Labs, would also cross paths with Berkley’s Quantum a bit down the road. In 1987, Kamerman started a new company, LaCie, to manufacture high-end external hard drives for the Macintosh line. Plus Development purchased LaCie in December 1990 for $3.8 million in cash. Kamerman continued to run LaCie as a Plus Development (and later Quantum) subsidiary through the mid-1990s.

Quantum Corporation still exists today although it now focuses on the storage systems business. Quantum sold its hard drive division to Maxtor in January 2002 in a stock swap valued at roughly $1 billion. LaCie was not part of that deal, as Quantum had already sold it back in 1995 to a French company, électronique d2, which then adopted the LaCie name. Seagate Technology acquired this new LaCie in 2012 for $186 million.

Notes from the Random Access File

- This episode is available at the Internet Archive and has an original broadcast date of December 17, 1985.
- Priam Corporation, which was founded in 1978, had started 1985 by acquiring another hard disk manufacturer, Vertex Peripherals. The combined company continued on for another four years. In 1989, Priam filed for Chapter 11 bankruptcy protection, having not turned a profit since 1984. The following year, Priam executives tried to relaunch the business under the name Priam Systems Corporation. But in 1991, the not-at-all-confusingly named Prima International acquired Priam's remaining storage products line. As for Alan Ebright, he went on to have a long career in storage systems, working as a vice president at Maxtor in the late 1990s and early 2000s before becoming a consultant.
- Mark Wozniak continued to run Computer Plus until 1991. He later worked for Sony Computer Entertainment, the early Internet search engine AltaVista, and Acer America Corporation. His most recent position with Merchant e-Solutions ended in 2016.
- Scott McVay remained with Iomega until 1987.
- The Iomega/Reference Technology Bernoulli Box/CD-ROM hybrid was called the CLASSIC DataDrive Plus. I could not find any evidence that this product ever made it to market.
- Apple did introduce the Macintosh Plus on January 16, 1986, for a retail price of $2,600.
- I actually knew GCC's Kevin Curran. Our paths crossed on a professional project back in the early 2000s. Nice guy.

Chapter 14: NaturalLink, Personal Consultant, and Q&A

As enthused as Gary Kildall was about many tech products, notably optical storage, he could be equally grumpy about other subjects, such as artificial intelligence (AI). For instance, back in an early 1985 episode Kildall got noticeably irate at the creator of the Halcyon, who insisted his not-quite-ready prototype of a LaserDisc-based game system had AI. Kildall later wrote that the Halcyon's botched on-air demo at least demonstrated that "natural languages and computers are not a good fit."

This next episode, the first broadcast in 1986, revisits this topic. Instead of experimental game systems, however, the products discussed were more conventional business fare such as databases and "expert systems." Kildall remained somewhat grumpy, especially towards one guest's product, but at least everything worked during the on-air demos.

Artificial Intelligence as a "Moving Target"

Stewart Cheifet opened the episode while standing in front of an elevator. He noted that a simple computer ran the elevator system. It knew to park the elevators on the ground floor in the morning and on the top floor in the evening based on the pattern of usage. But what if everyone were to suddenly go on the night shift? Well, he said, the elevators would still park themselves the same way, because the computer would require "artificial intelligence" to adjust to the changing conditions.

In the studio, Cheifet and Kildall were playing with *Racter*, a computer program that tried to carry on a conversation with the user. But Cheifet noted the program was so dumb it couldn't figure out what he was asking. (*Racter* came up in a previous episode, where its creators used the software to "generate" an entire book of prose.) Indeed, Racter's creators claimed the program used AI, which they said referred to "artificial insanity."

Cheifet said there had been many promises made with respect to artificial intelligence but not much delivery. Were there really any viable artificial intelligence projects out there today? Kildall joked that AI was a moving target. Once the basic research led to a product it was no longer interesting artificial intelligence work. For example, 20 years earlier Arthur Samuel developed a pioneering program to play checkers that was considered good basic AI research. Today, it wouldn't even make it in a Macy's store.

Kildall added that many companies offered products that claimed to have features like "natural language processing" and "expert system" capability. The challenge was to separate the fluff from the substance.

SRI Working on Military-Funded "Vision"

Wendy Woods presented the first of her two remote segments for this episode. This first segment looked at a project at SRI International to create "machine vision." Woods said that human beings were equipped with stereoscopic vision, a distinct feature that allowed us to judge distance and the relative placement of objects. In addition, humans knew how to identify the features of a landscape by color, shape, and placement.

But how could a computer be programmed to do the same and with the same information? Woods said SRI's machine vision project was designed to produce digital terrain models by scanning stereoscopic photographs of the Earth's surface. Working from illumination densities and reflectants' values, the terrain modeling system–with some human assistance–could calculate an image from any point of view. It could then synthesize a flight path through the terrain based on any chosen route.

While the process of creating topographic maps was simple geometry for a human being, Woods said, scanning a photograph, no matter how detailed, was full of ambiguities. For example, tall objects obscured smaller ones. Repetitive patterns could be confusing. And forms could be misinterpreted.

To overcome these ambiguities, Woods said, the SRI project was experimenting with artificial intelligence. The goal was to develop a program that could look at the global constraints of an image and the parts in context with the whole.

Like much of today's government-funded AI research, Woods added, this program was slanted towards military applications. But its future potential would help us recreate more exotic views, from inside a human body to the outside of the moon.

TI Offered Menu-Based "Expertise"

Dr. S. Jerrold "Jerry" Kaplan and Dr. Harry Tenant joined Cheifet and Kildall in the studio for the first of two round table segments. Kaplan was the principal technologist for Lotus Development Corporation. Tennant was a senior member of the technical staff at Texas Instruments (TI).

Kildall opened by noting that AI was a term that people appended to their products to make them sound fancier–like frosting on a cake–and therefore was at risk of being misused. He asked Kaplan how he characterized AI in working with new technology. Kaplan said artificial intelligence was a fundamental software technology of interest primarily to developers. It was not an end-user product in and of itself. There really wasn't much of an AI market except as tools.

Kildall followed up, asking what AI could add to a program. Kaplan said AI was really a method for programming using symbols and describing their interrelationships, thus enabling the software to reason and reach some kind of conclusions or enhance some existing application. Over the next few years, he said we could expect an increase in the utility and intelligence of such tools. He said that programs coming out of companies like Lotus would be able to know more about their intended use and interpret the user's intentions, as opposed to simply executing user commands.

Cheifet turned to Tennant and asked for a demonstration of Texas Instruments' *NaturalLink* system. Tennant explained that *NaturalLink* offered a way to ask questions of the computer in English, so the user didn't have to learn an arcane computer language.

What Tennant demonstrated here was not something like a modern Internet search engine. Rather, it was a database containing a specific set of information, in this case data about the state of Texas. The user would then "form" English sentences by selecting words from a series of drop-down menus. In this demo, Tennant constructed a sentence asking for the "average number of days of sun" in El Paso. The software returned an answer of "319 days."

Tennant said the benefit of this software was that someone who didn't know anything about the kind of database they were interfacing with or its programming could immediately see what kind of information was available and find out how to get that information out.

Kildall clarified that you couldn't actually type a sentence to query the database. Tennant said that was correct, the user relied on the menu system to construct their sentences. Tennant said he had been doing research for several years into natural language processing, which did involve typing sentences to make queries. But he then decided to develop the Naturallink approach, which had the benefit of ensuring that 100 percent of user queries would be understood.

Kildall continued to push back, asking how you would compare *NaturalLink* with a system where you actually typed sentences and there were algorithms and heuristics that tried to figure out the sentence. Tennant said that if you took away the menus from *NaturalLink*, the back-end used the exact same technology that was in a conventional natural-language system. He added there were limitations to any natural-language system and what TI had done was reveal those limits.

Still not satisfied, Kildall asked if you could start typing sentences if you "peeled off" the menu layer. Tennant said you could.

Cheifet turned to Kaplan and asked if he thought that *NaturalLink* was really an example of artificial intelligence. Kaplan said this was more of a tool, and what you were seeing was an application of that tool to create a database. But in general, he didn't think it was appropriate to say that something was–or was not–an "AI product." AI was not something special that you added to an existing program. It was an approach to programming that was flexible and useful in solving problems that previously might have required some sort of human intelligence.

Kildall added there was a gray area between a “user interface” and something that could really understand a sentence. Tennant interjected, saying he would define AI a little bit differently. He said that when AI started out in the early 1950s, it was really a set of problems, such as how we could make computers reason. This range of problems made up AI. Natural language processing is one approach.

Turning to another approach, Tennant offered his second demonstration, this time for TI’s *Personal Consultant*, an expert system product. Tennant described it as a tool for decision-making, in this particular case for diagnosing problems with a car. (Basically, this was an “Expert Mechanic” module for the *Personal Consultant* system.) In the demo, Tennant showed that by answering a series of questions presented by *Personal Consultant*, the software could present a diagnosis.

Kildall asked how this differed from a straight “yes or no” decision-making process where someone had simply put all of the possible answers into the computer. Were there other judgments and valuations? Tennant said it differed in the way the system was programmed. In the case of building a rule-based expert system like *Personal Consultant*, the knowledge that went in came in the form of a collection of rules. By chaining together smaller pieces of information the computer could make a decision.

Kildall asked if these tools could be extended to other applications, such as fixing refrigerators. Tennant said absolutely. He noted that expert systems were now being applied to a very broad range of applications. For example, there was one developed by Johns Hopkins University to diagnose poisoning situations. (This was actually demonstrated in a prior *Chronicles* episode.)

Cheifet turned back to Kaplan and asked him about what Lotus was working on with respect to AI. Kaplan said they were looking into new classes of applications and products, which he wasn’t prepared to announce at this time. But broadly speaking, Lotus was looking at flexible databases and decision-support systems.

Stanford Professor Warned of “Star Wars” Influence on AI Research

For her second remote segment, Wendy Woods interviewed Stanford University computer science professor Terry Winograd. Woods said Winograd was currently working on two projects–one programming and one political. The first was a natural language for programmers that enabled them to use simple English words referenced to the kind of work the software will be doing.

Winograd told Woods that the goal was to get away from giving very specific details of what the machine should do to putting things more in the terms that make sense to the programmers in their world. If you’re doing payroll, for instance, you want to think about people and payrolls and money, not about disk files and records and what is in the computer.

Winogard’s second project concerned funding for AI research, Woods said. He’s worried that too many of his colleagues were being lured into lucrative Defense Department contracts, detracting them from basic research into AI. Winogard said the Reagan Administration’s “Star Wars” program in particular was going to distort research. Woods added that up to 50 percent of computer science research was supported by military grants, and only a fraction of computer scientists had refused them.

Woods said that Winogard and dozens of computer science professors were now circulating petitions asking their colleagues not to accept “Star Wars” funding. Their belief was that it will drain money from AI projects with practical applications.

Speaking in Complete Sentences to a Database

For the second and final round table, Gary Hendrix and Dr. Hubert Dreyfus joined Cheifet and Kildall. Hendrix was vice president for advanced technology with Symantec. Dreyfus was a professor of philosophy at the University of California, Berkeley, and the author of *What Computers Can’t Do: The Limits of Artificial Intelligence* (1972) and *Mind Over Machine:*

The Power of Human Intuition and Expertise in the Era of the Computer (1986).

Kildall asked Dreyfus what he saw as the “fallout” from AI in terms of useful products. Dreyfus said that really wasn’t his field. He was a philosopher interested in the limits of AI. So he wasn’t sure about the fallouts. But he said that you couldn’t use symbolic descriptions and inferences to make computers intelligent like humans. That didn’t mean you couldn’t find many uses for computers, however.

Why couldn’t you do that, Kildall asked? Dreyfus said that people began by using rules when they’re learning some new skill. But as they developed experience, they recognized the situation they were in as similar to one they’d already been in and just did what worked before. Therefore, they didn’t need to analyze the situation. In fact, analysis was really for beginners. Intuition was for experts.

Cheifet asked Hendrix if he disagreed with that. Hendrix said there was some truth in what Dreyfus said. But we had to start with the premise of what’s the enterprise we’re involved in. One enterprise was the academic efforts to push AI to the limits to find out just what a machine was capable of doing. Another enterprise was to take the body of techniques that had been developed so far and try to put them into useful products. Hendrix said he personally believed we hadn’t reached the limits of what we could do with AI but he was still focused on practical tools.

Kildall next asked for a demonstration of *Q&A*, a database product from Symantec, which Hendrix described as an “intelligent assistant.” He said that unlike the TI *Personal Consultant* system that relied on menus, *Q&A* let the user type questions in English. The software then analyzed the user’s statements to figure out what they wanted to do.

In his demonstration, Hendrix asked a sample database, “I want you to find the forms for sales people who earn more than $15,000 and display them for me.” The software then broke this down into a proposed series of steps:

> Shall I do the following?

Select and view the forms in which

The Department is SALES and

The Salary is > $15,000.00

Q&A then presented each of the matching forms one-at-a-time. You could also pull up a list of all matching forms.

Hendrix said you could also ask follow-up questions using pronouns. For example, he asked *Q&A* to show the names and addresses of “these people,” referring to the salespeople identified in the original query.

Kildall interrupted, asking if an untrained individual could simply come in and just type any sentence. Hendrix quipped you certainly couldn’t ask, “What’s interesting on TV tonight?” and expect a response. But to answer the question, Hendrix said *Q&A* could not parse 100 percent of the sentences that were typed. But if your purpose was not to break the system, but rather get a job done, and you cooperated with the system it would work.

Cheifet asked Hendrix to explain the “teaching” part of *Q&A*. Hendrix said that if a user typed a sentence with a word that was unfamiliar to *Q&A*, the program will stop. As an example, Hendrix typed, “If an employee has a salary between the average Harvard Man’s and John’s, let me see an evaluation and review contents.” The program did not know the word “man.” Hendrix said the system presented a few options. One of them was to “teach” the word as a synonym for a “male” in this database.

The program also stopped on “John” because there were two Johns in the database, Cheifet pointed out. Hendrix said you could simply select which “John” you wanted from a list of matching entries. You could also look at individual forms if you needed more information to determine which John was which.

Cheifet asked Dreyfus for his views on the demonstrations seen during the program. Dreyfus said they were impressive. But he cautioned that “expert” systems could only do about 80 or 90 percent as well as the experts in a given field. He would call them “competent systems.” But once you were willing to settle for competence–which was important and valuable–you could then use rules and inferences to make these competent systems useful. But it was a mistake to think that if you just worked harder you could get to “expertise,” i.e. that last 15 percent or so.

Dreyfus added there were two kinds of expertise. The first was the “calculating” kind where a computer could actually do better than people. But most expertise was “intuitive,” where you ended up settling for less with a computer.

Should AI Take an IQ Test?

In his closing commentary, George Morrow said that terms like “artificial intelligence” and “expert systems” were first coined in the late 1950s when university-based computer research was largely funded by the military. These terms were therefore likely used to impress the granting agencies more than anything.

Morrow said much of today’s AI software was novel and very useful. But none of these products would be able to live up to what the term “artificial intelligence” invoked. He agreed with Hubert Dreyfus that we should call expert systems “competent systems.” And if a manufacturer insisted its products had artificial intelligence, that product should take a standard IQ test–with the score affixed to the package!

Would 1986 be the Year of Speech Recognition?

Stewart Cheifet presented this week’s “Random Access,” which was recorded in early January 1986.

- Some industry watchers were saying that 1986 would be the year that speech recognition technology came into its own. Cheifet said there were three major speech products that could come out this year. Ray Kurzweil promised a word processor that accepted dictation and offered a 10,000 word dictionary. Speech Systems was expected to release a similar product with a 5,000-word vocabulary. And IBM was developing its own product, called *Tangora*, although there was no word when it might be released. Cheifet added that MIT, Carnegie Mellon, and various Japanese companies were also heavily investing in speech recognition technology.

- IBM was expected to release its new "clamshell" portable computer in 1986. Cheifet said the rumors were that IBM would actually release two versions–one with a 3.5-inch floppy disk drive and one with no drive. The model-with-drive would also come with a utility called *Xcopy* that would let a user copy software from a 5.25-inch disk drive. Cheifet added these reports also suggested that IBM would start using 3.5-inch drives on its desktop PCs, setting the stage for a new standard.
- IBM was also expected to release a new graphical version of *TopView*, although Cheifet said some reports suggested that version 2.0 would not be out until 1987.
- Paul Schindler reviewed *PFS:Access* (Software Publishing Corporation, $95), a communications package.
- The national computerized Yellow Pages was now a reality. Chefiet said it was called *American Business Lists*, and it cost $15 per month to access plus $1 per minute connection time. The publisher claimed the online directory contained 6 million business listings.

Dr. Hubert L. Dreyfus (1929 - 2017)

Hubert Dreyfus passed away in 2017 at the age of 87. Dreyfus taught at MIT in the 1950s and 1960s before moving to the University of California, Berkeley, in 1968. He taught at Berkeley until 2016.

Dreyfus first gained notoriety at MIT as a critic of the potential impact of computers on society. According to an August 1966 report in the *Terre Haute Star*–Dreyfus was from Terre Haute, Indiana–the professor published a pamphlet through the Rand Corporation outlining his tech skepticism:

> In essence, Dr. Dreyfus believes the computer has been greatly overrated and will never replace man's thinking and ability. He says the machine cannot and will not work properly.

> In the beginning, though, the computer registered dramatic success, but problems arose and disenchantment resulted. For instance, a computer beat an ex-champion from Connecticut in checkers, but the machine had no luck in chess.
>
> Dr. Dreyfus believes a computer’s attention cannot be attracted by areas on the board that look interesting. It fails to zero in on possibilities that appeal to a type of “fringe consciousness.”
>
> Computer programs have been falling short in language areas, especially in translating. Moreover, Dr. Dreyfus compares the work of specialists attempting to produce artificial intelligence by means of computers with the ancient alchemists who tried to make lead into gold.

Computers eventually learned how to beat humans at chess, of course, but Dreyfus remained steadfast in his views that machines were incapable of learning or applying “common sense.” A March 1985 article from the *Austin American-Statesman* noted that Dreyfus had been dubbed “the black knight” of AI by a leading science magazine for his stance. But Dreyfus told the paper that he didn’t think so-called expert systems could ever “be programmed to answer the kind of question that a four-year-old child can.”

Dreyfus was such a well-known AI critic at the time that it apparently caused something of a problem for Stewart Cheifet and the *Chronicles* production team. In a 1986 paper co-authored with his brother, Stuart Dreyfus, and published in the *MIT Technology Review*, Dreyfus revealed that he’d been scheduled as a guest for the March 1984 *Chronicles* episode on artificial intelligence that also featured Stanford University professor John McCarthy–the man credited with inventing the term “artificial intelligence”–and IntelliCorp’s Thomas Kehler. Naturally, Dreyfus said he was there to provide a “balanced perspective” on the promise of AI. But things didn’t go according to plan:

> After much negotiating, an evening was finally agreed upon for taping the discussion.

> That evening the producer and technicians were standing by at the studio and [Dreyfus] had already arrived in San Mateo when word came that McCarthy would not show up because Hubert was to be on the program. A fourth participant, expert-systems researcher Michael Genesereth of Stanford University, also backed out.
>
> All of us were stunned. Representatives from public TV's NOVA science series and CBS news had already interviewed [Dreyfus] about AI, and he had recently appeared on a panel … [with] McCarthy himself at a meeting sponsored by the New York Academy of Sciences. Why not on KCSM? It seems the "experts" wanted to give the impression that they represented a successful science with marketable products and didn't want to answer any potentially embarrassing questions.
>
> The shock tactic worked. The station's executive producer, Stewart Cheifet, rescheduled the taping with McCarthy as well as the demo from IntelliCorp, and he decided to drop the discussion with [Dreyfus]. The viewers were left with the impression that AI is a solid, ongoing science which, like physics, is hard at work solving its quote manageable current problems. The public's chance to hear both sides was lost and the myth of steady progress in AI was maintained.

Obviously, Dreyfus didn't hold a grudge as he appeared in this episode, which Cheifet no doubt offered as a makeup for what happened with McCarthy and Kehler. I'd also point out that the first AI episode had Herb Lechner, and not Gary Kildall, as the co-host. I wonder what Gary would have done if he had been present for McCarthy and Kehler's unprofessional no-show.

Hendrix's Early Symantec Struggles Created Base for Future Antivirus Giant

Stewart Cheifet introduced Gary Hendrix as a vice president with Symantec. Technically, Hendrix was the *founder* of Symantec. Although, as is often the case when researching the history of technology companies, the complete story is far more complicated.

Hendrix started working in artificial intelligence research as a graduate student at the University of Texas in the early 1970s. As this episode illustrated, Hendrix's particular field of interest was natural language processing. According to an oral history interview conducted by Dag Spicer for the Computer History Museum in 2004, Hendrix authored a paper that caught the attention of SRI International–the subject of Wendy Woods' first report from this episode–and he ended up joining SRI even before completing his doctorate.

While working at SRI, Hendrix decided to start an AI-based business. This led to the formation of Machine Intelligence Corporation in 1979, which Hendrix said included 15 people from SRI and Stanford who each contributed $5,000 in capital. Hendrix brought in an industry veteran, Arthur Lash, to serve as CEO.

Machine Intelligence's initial project was developing a system for using natural language processing to assist in manufacturing. The company received a $25,000 grant from the National Science Foundation to fund the basic research. Hendrix said they managed to produce a Pascal-based prototype for the Apple II that could parse sentences, although there was no database at this point. (The database back-end was later developed by Jerry Kaplan, who worked as a consultant for Symantec.)

The NSF eventually provided Machine Learning with an additional grant of $250,000. But Hendrix said shortly thereafter, Lash decided to focus the company on another area of research, robot vision systems. Machine Learning ended up partnering with a Japanese robotics company–Hendrix could not recall the name–but that ended up going nowhere. That was effectively the end of Machine Learning, Hendrix said, but not of his own natural-language processing project.

After contemplating a sale to Hewlett-Packard, Lash agreed to spin-off Hendrix's project into its own company, which was incorporated as Symantec Corporation in 1982. Hendrix said he initially owned 60 percent of Symantec, with Machine Learning retaining the other 40 percent. Lash brought in Steve Shanck, a former Apple sales executive, to serve as Symantec's CEO.

After Symantec presented a demo of its AI technology–still running on the Apple II–at the American Electronics Association's March 1983 conference, venture capitalist John Doerr of Kleiner Perkins agreed to invest $3.5 million in the company. (Doerr previously appeared in a March 1985 *Chronicles* episode discussing IBM's impact on the industry.) But as Hendrix later admitted to Spicer, his team of mostly academic researchers struggled to develop a viable database product that could actually take advantage of Symantec's natural language processing research. In particular, Hendrix realized that development needed to move away from Pascal and towards C and assembly language, which would make a product that was more viable on microcomputers like the IBM PC.

Doerr's solution was to basically merge Symantec with another struggling software company, C&E Software, Inc., which was started by Dennis Coleman and Gordon Eubanks in 1983. Gordon and Eubanks previously worked for Gary Kildall at Digital Research. They had started C&E hoping to target the low-end of the office software market, including their own database product. C&E also struggled to ship a product, but its five-person team had far more experience with C and assembly language.

On paper, C&E acquired Symantec, which continued to exist as a wholly owned subsidiary for several more years. Eubanks replaced Shanck as CEO. Hendrix remained in charge of software development, having replaced most of his old Stanford and SRI colleagues with C&E's programmers.

The reorganized Symantec would finally release its database product, *Q&A*, in September 1985. It initially retailed for $300. Notably, *Q&A* required a minimum of 512 KB of memory, which was quite hefty for the time period. (The PC-AT, for instance, came with 256 KB standard.) Symantec therefore also sold an add-on 256 KB memory board for $50.

Q&A went on to enjoy a long life in software terms. Symantec continued to publish updated versions well into the Windows era, with the final release, *Q&A 5.0*, coming in 1995 and official support ending in 1998.

Symantec itself continues to exist today though not under that name. This is, yet again, where the story gets complicated. Even before *Q&A* released, Symantec published another product called *Note-It*, a utility for Lotus Development's *Lotus 1-2-3*. *Note-It* was not released under the Symantec name but rather that of Turner Hall Publishing. This was a Symantec subsidiary named after two of the company's marketing executives, Rod Turner and Dottie Hall.

Even after *Q&A* proved successful and Symantec started making money, its business quickly started to shift away from Hendrix's AI-based work towards utility software. Starting in 1987, Symantec went on an acquisition binge, purchasing several other companies to grow in sales and staff. In 1988, a newly formed Symantec Corporation in Delaware absorbed both the original Symantec and C&E. This new Symantec went public in 1989. The following year, Symantec acquired Peter Norton Computing, one of the leading DOS-based utility software developers. Another year later, in 1991, Hendrix left Symantec and moved back to Texas.

During the 1990s, Symantec became synonymous with antivirus and computer security software. Eubanks resigned as CEO in 1999. His successor, former IBM executive John W. Thompson, sold off all of Symantec's non-security related products and purchased data center software giant Veritas in 2004. As writer Richard Stiennon noted in a 2020 article for *Forbes*, the Veritas deal "was a major blunder." After paying $13.5 billion for Veritas, Symantec ended up selling the division to the Carlyle Group in 2015 for $8 billion.

In 2019, Symantec renamed itself NortonLifeLock, combining the Norton name with LifeLock, yet another brand acquired by Symantec in 2016.

TI Found AI Success…in Soup?

Texas Instruments had been one of the many tech companies to enter–and exit–the personal computer business during the first half of the 1980s. After pulling out of that market altogether by 1985, TI turned to expert systems and AI as a potential growth area. In addition to the software demonstrated on this episode, TI also sold a line of dedicated Lisp machines called the Explorer.

Personal Consultant initially retailed for $3,000 when it was released in 1984, according to *InfoWorld*. But by late 1985, TI decided to offer a basic version of the program for just $950 and a more expensive *Personal Consultant Plus* for advanced users. The cheaper version was later renamed *Personal Consultant Easy*, and by 1989 an updated version was available for $500.

The expert systems market seemed to fizzle out by the end of the 1980s. But technology like Explorer and *Personal Consultant* did have its niche, as Joe Watson explained in a now-archived article from the Texas Instruments website:

> Probably one of the best known commercial expert system applications from this era was the Campbell soup story. One of their long-time experts, who had intimate and detailed knowledge about the soup processing factory flow, was about to retire. Soup was cooked in the can after sealing, and it was essential that a carefully controlled time and temperature profile be followed in the cooking process, or the soup would be spoiled. Whenever one of their many soup canneries developed a flow problem, the result was a lot of bad soup, so the expert would be consulted to quickly correct the problem. In order to preserve the expert's knowledge base, a group of TI "knowledge engineers" was called in to capture his knowledge, codify it and make it available through an expert system. The company reported that this project was very successful.

Notes from the Random Access File

- This episode is available at the Internet Archive and has an original broadcast date of January 2, 1986.
- Jerry Kaplan's major contribution at Lotus was co-authoring an information manager tool called *Agenda*. In 1987, Kaplan co-founded GO Corporation, which developed early operating systems for pen-based computers. Kaplan has been involved in a number of other tech startups since then and today remains affiliated with Stanford University as an adjunct lecturer.
- Harry Tennant remained with Texas Instruments until 1994.

- Terry Winograd spent nearly 40 years as a professor at Stanford, taking emeritus status in 2012. In addition, Winogard was an advisor and visiting researcher with Google from 1998 to 2012, having previously served as an academic advisor to company co-founder Larry Page.
- Dr. Hubert Dreyfus was so well-known as an AI critic that his views on artificial intelligence has its own Wikipedia page.
- One of Dreyfus' graduate students at Berkeley was Eric Kaplan, a former writer for the animated series *Futurama*. Kaplan said the character of Dr. Hubert Farnsworth from that program was named in honor of Dreyfus.
- IBM never released a GUI for *TopView*. By 1987, IBM shifted its development to a new operating system–OS/2–which did feature a GUI, but that did not debut until 1988.
- IBM did, however, release that "clamshell" portable. Known as the IBM Convertible PC (a/k/a the IBM 5140), it came out in April 1986 with *two* 3.5-inch drives and initially retailed for $2,000.

Chapter 15: SHURLOC, OCIS, and Probe One

During this third season of *Chronicles*, there have already been several episodes dedicated to the impact of computers on specific vocations, including the media, politics, and medicine. (There was also an episode on the legal profession, which is among those still missing from the Internet Archive.) This next episode from January 1986 continues the trend, with a show discussing computers in law enforcement.

Giving Law Enforcement Rapid Access to Information

Stewart Cheifet delivered his introduction from an FBI office. There was a woman typing at a computer. Cheifet said she was a computer scientist for the FBI trying to solve a crime. He noted that law enforcement agencies around the country were now using computers to make police work more efficient and effective.

In the studio, Cheifet and Gary Kildall looked at *Murder by the Dozen*, a computer game for the Macintosh where the player had to solve crimes in a fictional city called Micropolis. (Cheifet mistakenly called it Metropolis.) Cheifet noted that in the game the player could use a “crime computer” to gather clues. He added that real police were now using real computers to catch real criminals.

Cheifet asked Kildall if this was yet another example of a “vertical application” of a computer’s ability to massage massive amounts of data. Kildall said it was a whole lot more because you were dealing not just with data but also graphical materials like fingerprints and photographs. No one person could deal with such things on 3-by-5 index cards or scraps of paper. So it was interesting to see how computer technology, data communications, and database systems were applied in this area where users needed to have rapid access to information.

California Attorney General Introduced Computerized Fingerprint System

Wendy Woods presented the first of three remote segments for this episode. She reported from the California Department of Justice in Sacramento, which had implemented a computerized fingerprint system called Cal-ID. Woods said that since Scotland Yard had started using fingerprints to track criminals in the 19th century, law enforcement agencies have faced the uncomfortable fact that a fingerprint without a suspect was often useless.

Woods explained that to match a smudged print taken from the scene of a crime to one of the millions on file was so time-consuming that a criminal was likely to die before an accurate match was made. To break this intricate code of loops and ridges that made a person unique, the California DOJ replaced its seven million fingerprint cards with optical discs and exchanged manual searches for a pattern search by computer (i.e., the Cal-ID system). Woods said the results had been rewarding.

At a previously recorded press conference, California Attorney General John Van De Kamp said that in a recent case involving the murder and kidnapping of two UCLA students, the only available fingerprint was very faint, having come from a car that was “torched” to destroy any clues. He said this was an example of a case that would never have been solved without Cal-ID. He explained that matching this particular print required searching three million records. He estimated it would have taken a fingerprint specialist 67 years to perform that search manually. Cal-ID performed it in less than 20 minutes.

Woods said that Cal-ID relied on a $20 million NEC supercomputer that could search 12 million digitized prints at a rate of 12,000 per second. As the prints came in they were scanned and electronically stored. *Minutiae*–the identification points of a fingerprint–were then mapped out according to the number of ridge lines between one point and its four closest neighbors. It was the relative position of each point to the others that the computer considered when looking for a match. Each print was given a score, indicating the probability of an exact match. But the final confirmation was still done by a human being.

Woods said the Cal-ID system would ultimately offer remote access so that local police departments could get immediate help from the world's fastest–and most accurate–sleuth.

Computers Facilitated Expansion of 911 Service

Louise Anderson and Steve Port joined Cheifet and Kildall in the studio for the first of two round tables. Anderson was the marketing coordinator for Command Data Systems in Dublin, California. Steve Port was a captain and operations commander with the Hawthorne Police Department in Los Angeles County.

Kildall opened by asking Port how computers had helped him as a police officer. Port said computers had helped greatly. His department started with computer-aided dispatch about 10 years ago. It had greatly simplified call-routing and finding what officers were available and responding to calls more efficiently.

Kildall asked about the use of computers with this 911 system he'd been hearing about. (The first 911 systems were deployed in the United States in the late 1960s, but even by the mid-1980s they were still not universally available.) Port said it had been great because when people called 911, the police could immediately find out what address they were calling from and dispatch officers right away.

Cheifet asked Anderson to explain how the 911 system worked with a Digital Equipment Corporation VAX computer. Anderson said that when a dispatcher received a 911 call, they would see the information associated with that telephone number on the bottom of their terminal display. If a caller gave a general description of their location, such as a supermarket, the computer could help the dispatcher narrow down the possible options, i.e., which supermarket. Kildall said the computer then effectively coordinated all of the dispatch information through a central computer system. Anderson said that was correct.

Kildall then asked Anderson to demonstrate another product made by Command Data Systems called *SHURLOC*. Anderson explained this was a crime analysis system. This system made it possible to conduct searches when you didn't know a person's name or a particular case number. Cheifet clarified this would be useful in a situation where a witness might give a general description of a suspect but not their identity. Anderson said that was correct.

Anderson performed a sample search in *SHURLOC* for a particular make and model of car, in this case a Chevy or Ford manufactured between 1960 and 1970. Kildall asked how big the database was. Anderson said this was a demo database so it didn't have many records. But for a regular police department, you might have 300 to 400 people in a "known offender" file.

Anderson continued her demo. The software pulled up eight matches for the vehicle parameters entered. Anderson said that in a hypothetical criminal investigation, a detective could then try to match a suspect description with one of those eight vehicles, or at least narrow the list down.

Cheifet asked Port if this sort of system actually led to a higher rate or arrests and convictions. Port said it was hard to say. But he added the real benefit was that any officer could perform this type of computer search, as opposed to going to one central focal point and asking someone else to perform a manual search. From that standpoint, the police were more productive because they could have a faster turnaround in accessing information.

San Jose Among First Cities to Equip Police with Mobile Computers

Wendy Woods presented her second remote segment, this time from the San Jose Police Department. Woods noted that for years, police departments kept track of units in the field through "the old card-on-a-peg" method. Today, more departments had computerized their dispatch services, and San

Jose’s police department was among a handful who had taken computers one step further. All command officer squad cars were now equipped with mobile computer terminals that provided officers with access to the location and status of all units in the field, as well as motor vehicle and crime record information from state and national databases.

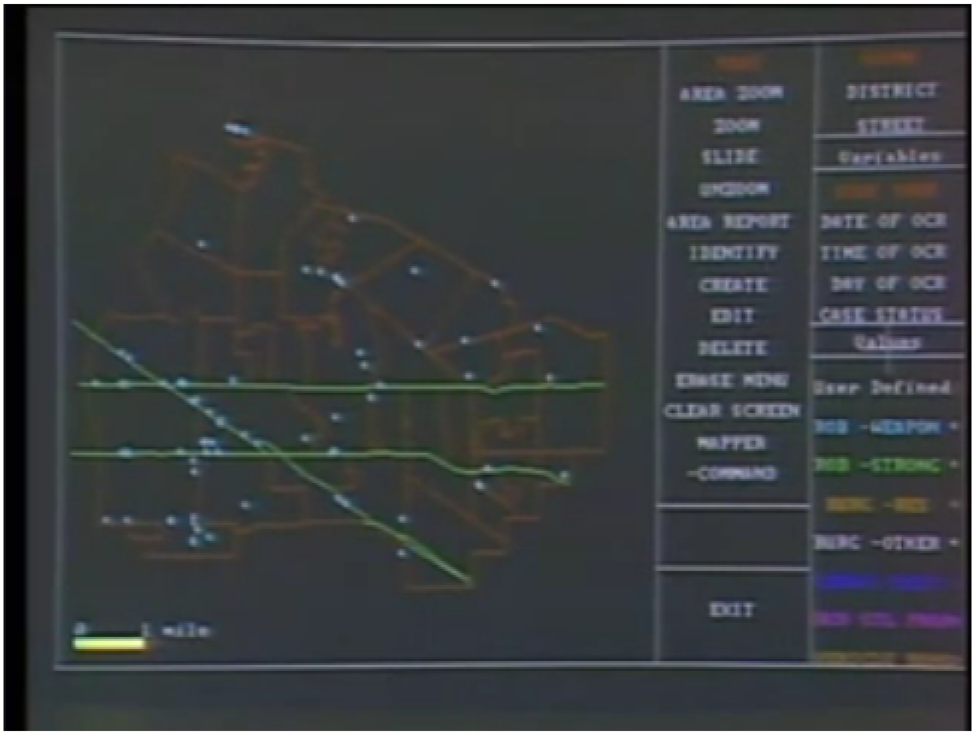
Sargent Aubrey Parrott of the San Jose Police Department told Woods that when the computer system went down temporarily you really felt lost. It was like being in a dark tunnel with no lights available. You ended up spending a lot of time listening to the radio and talking with the dispatcher to keep track of everyone.

Woods explained that San Jose police’s 48 mobile units accessed a separate radio frequency and interfaced with Santa Clara County’s giant digital minicomputers, which controlled the entire dispatch system via a single IBM PC. Woods said the system had performed flawlessly since it was installed six months ago.

Woods said that within the next few years, virtually all metropolitan police departments were expected to install similar mobile terminals in their own squad cars. Now that the terminals were smaller, they were less conspicuous.

Mapping Crime Statistics

Back in the studio, Louise Anderson and Steve Port demonstrated another of her company’s systems. This one ran off a Compaq Portable. Port explained the system integrated a database with graphics software that could produce a map of the city. In the demo, the software extracted from the database all of the robberies that had occurred within the past 30 days and plotted those crimes on the map (see below).



A screenshot from a program designed to map crime statistics in a city. The left part of the screen is dominated by a map represented by red and green lines, with white dots indicating specific crimes. The right side of the screen has a variety of technical information about the software.

Port said he could then take this visual information, go to his lieutenants and sergeants, and ask them to come up with a plan to deploy officers and deal with these crimes. Kildall said this database was kept up to date then. Port said yes, it was updated every day.

Cheifet asked if you could actually select a “dot” on the map and get more information about that particular crime. Port said yes, all you had to do was click and the software would pull up a separate screen with a full crime report. Kildall asked about other functions of the software. Port said you could zoom in on specific streets or districts.

Cheifet clarified that these systems were actually in use now and not just a demo model. Anderson said that was correct. In addition to the Hawthorne department, Anderson said her company installed a similar system for the Norwalk, California, police department, which was also located in Los

Angeles County. Command Data Systems was also contracted to install systems in several other places.

FBI Official Credited Computers with Helping to Catch Assassin

Stewart Cheifet presented the third and final remote segment, this one from the headquarters of the Federal Bureau of Investigation (FBI) in Washington, DC. Cheifet said the FBI used a sophisticated collection of the latest computer hardware and software in catching criminals. Indeed, the FBI had invested over $500 million in computers. The agency had seven mainframes, many with coupled backups, located at the National Crime Information Center. Cheifet said the FBI's systems could store up to 250 billion text characters, 17 million records, and more than 500,000 transactions per day. There were also 20,000 terminals that could access the system.

Cheifet said that computers had given the FBI investigative capabilities that it never could have had in the days of 3-by-5 index cards. He said that one example was a murder case involving a judge in Texas. William A. Bayse, the FBI's assistant director, told Cheifet an alibi for one of the suspects was that he was in a different place. The FBI went through local hotel registrations looking for the suspect's name or aliases. By using computer search, the FBI was able to determine the suspect was in San Antonio the night of the murder.

Cheifet said that one of the FBI's top priorities was domestic terrorism. And with its new computer systems, FBI agents could access critical information in the field. Bayse said that for example, an agent could follow a van on Route 10 heading out of El Paso, Texas, with suspected terrorists. That agent could now access any FBI database from his car while driving and still maintain visual surveillance.

Cheifet said the FBI also used computer-generated behavior profiles. In a hostage crisis, the agency consulted with computers to predict terrorist behaviors and helped in developing a negotiating strategy. The computer was used not only to catch criminals after the crime had been committed but to prevent them in the first place. Bayse said the FBI had a file sponsored by the United States Secret Service of threats to federal protectees such as the President of the United States. Bayse added that one hour after that system became active, there was a hit on someone on their way to Washington with a threat against the President. For the first time, Bayse said the Secret Service could track people who were not under arrest or detention but were still considered “legitimate” threats.

Cheifet said the FBI was most proud of its use of artificial intelligence, particularly its Organized Crime Information System (OCIS), an expert system engineered using knowledge from the agency’s top agents. The system applied rules to a massive database looking for “suspicious” conduct.

Using Expert Systems to Look for Serial Killers

For the final segment, Dr. Earlene Busch and David Hall joined Cheifet and Kildall. Busch was the founder and president of Information Access Systems in Boulder, Colorado. Hall was the director of information systems programs with Search Group, Inc., in Sacramento.

Kildall opened by asking Busch for a demonstration of her company’s software, known as *Probe One*. Busch said it was an “investigative information management system.” It was a professional support system for law enforcement. She quipped that *Probe One* could be viewed as the “Watson” to Command Data Systems’ *SHURLOC*.

Busch explained that *Probe One* enabled investigators to search for a criminal *modus operandi* using their own language. For example, a detective could ask the system to provide documents about homicides where the victim was assaulted and the body was found in a car. Busch said the system handled such a request like a document–that is, it determined the subject matter and searched a series of telex dispatches.

Kildall clarified that without this type of system, an investigator would have to review all this information manually. Busch said not only would the investigator have to read it, they would have to find it first. In that sense, *Probe One* functioned as a very good research assistant.

In the demo search, Busch said there were 28 documents that were relevant to her request, which were ranked in relevance order. Cheifet asked for clarification about what “relevance” meant. Busch said in simple human terms, it was “like it in subject matter,” i.e. other murder cases where victims were found in cars.

Cheifet asked if a close match in terms of relevance meant that both crimes were committed by the same person. Busch said that was the general concept behind a *modus operandi* search–finding a pattern of criminal behavior that was repeated. (Busch then read some details from her sample match, which I won’t repeat here.)

Kildall wanted to know more about the technology behind *Probe One*. Did the program actually take apart or parse the sentence typed in by the user? Busch said no, the user told the system upfront the subject matter it would be handling. In this sample case, it was asked to handle “homicides.” The system could be adopted for other, non-criminal subjects, such as mining support or a legal library. Kildall asked how any placeholder words like “the” and “or” were treated. Busch said the system ignored them.

Kildall continued to press on how the matching process worked. Did the software pre-analyze all of the documents? Again, Busch said no, the program analyzed the subject matter and the terms that made distinctions between subject matters, such as between “victims” and “homicides.”

Cheifet noted that *Probe One* was being used by law enforcement in the State of Washington as part of its investigation into the Green River murders, a series of unsolved homicides believed to be the work of a serial killer. He asked Hall to what extent do police departments share these kinds of databases and information. Hall said databases like *Probe One* were very difficult to share. There was no system designed at the moment to transfer documents back-and-forth easily. So you had to know what you were looking for when you called another police department to ask for information from their database.

Kildall asked Hall if he saw that trend changing towards more integration. Hall said that he believed with the development of systems like *Probe One*, including the FBI's OCIS, you would see greater sharing.

Cheifet asked how often these types of sophisticated systems were actually used. Was cost a major factor in determining whether a police department could get into this kind of computer support? Hall said definitely. It was a difficult process to secure funding from states and municipalities for these systems.

Kildall asked if there were any concerns about the potential for the abuse of databases that collected information about people related to crimes. Hall said it depended who had access to the information. The databases they were discussing here would only be open to law enforcement and criminal justice agencies. It would not be something out in the public.

Cheifet asked if the use of the *Probe One* in the Green River investigation was the first time such a system had been applied to an active investigation. Busch said yes. The other prior application was office automation. Cheifet asked what sort of feedback Busch had received from law enforcement in Washington. Busch said the officer managing the system in Washington was "quite enthusiastic."

Kildall wanted to know how much decision-making was actually done by the program. Do the investigators actually go back and check to see if the cases are relevant? Busch said the judgment the computer made was simply in reference to the document base and relevancy to the request.

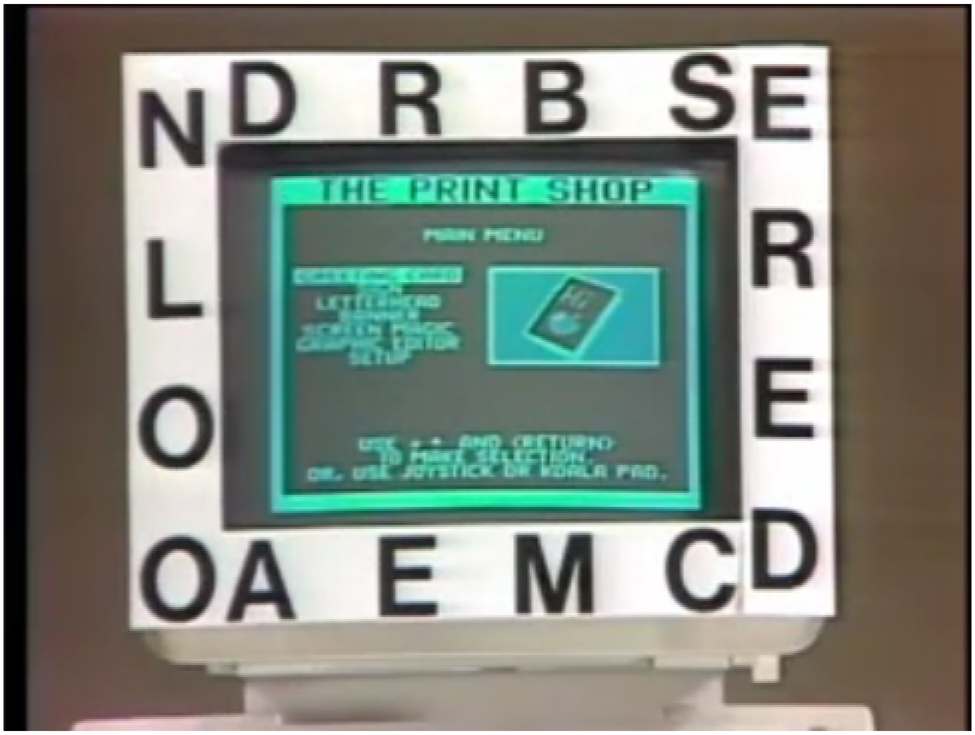
Would Police Computers Save Taxpayers Money in the Long Run?

George Morrow's closing commentary focused on the ethical and fiscal implications of the use of computers by law enforcement. He said certain security features built into computer operating systems, such as system logs, could help keep abuse of information by law enforcement personnel to a minimum. But we also needed to realize that computers were a potentially productive tool for police departments. Criminals almost always repeated the way they committed a crime. And computers were particularly good at spotting and analyzing repetitive patterns. They also saved time and paperwork. Computers could ultimately make tax dollars work harder for taxpayers when it came to law enforcement.

New “Pixar” Computer Used to Create Special Effects for Sherlock Holmes Film

Stewart Cheifet presented this week’s “Random Access,” which was recorded in January 1986.

- IBM was expected to release several new products on January 21, 1986, including the “clamshell” laptop portable and *TopView* 1.1. Cheifet said the new version of *TopView* would reportedly add networking features and support for 3.5-inch disk drives. But it would not address the 640 KB memory limit of MS-DOS.
- Atari Corporation reportedly planned to release an upgrade of the 520ST called the 1040ST. The new machine would have over 1 MB of memory and integrate the power supply and disk drive into the main unit. Atari also announced a new version of the 520ST with an RF converter would start appearing on the shelves of retailers like K-Mart and Toys ‘R’ Us.
- Several major pieces of computer legislation remained pending at the start of the new congressional session.
- Epson and Toshiba announced the development of new color LCD screens for computers. Epson said its new 5-inch color LCD was 10 times brighter than existing black-and-white LCD screens and featured a resolution of 480-by-440 pixels.
- A California optometrist released a new $15 screen overlay template called the “EyeSaver” (see below) to help reduce eye strain by focusing a user’s eyes at the correct level.



A white template surrounding a green-and-black computer monitor from the 1980s. The template is decorated with a number of letters. On the screen, a copy of Broderbund's "The Print Shop" is running and displaying the main menu.

- The developers of a new program called *House Call* promised to diagnose up to 400 medical problems. The program cost $40 and came on two double-sided floppy disks.
- The recently released film *Young Sherlock Holmes* included a special effect of a knight jumping out of a stained-glass window and waving a sword. Cheifet said the effect was produced using a new computer from Industrial Light & Magic, a division of LucasFilm. The computer was called "Pixar" and not only produced the image but electronically combined it via laser scanning with the existing film footage of an actor. The 38-second effect took the Pixar and six engineers nine months to create.

{{< youtube iB9KoJ79tGY >}}

Busch Retired from Making Expert Systems to Create Organic Cuisine

Earlene Busch is a native of Colorado. According to a profile by Scott Noble for *Saltscapes Magazine*, she grew up on a wheat and cattle ranch. Busch, whose maiden name was Kingrey, enrolled at the University of Colorado in 1958. While on a family vacation in Mexico she met a United States Air Force pilot, Elwin Busch, and they married at the end of her freshman year, in June 1959. The couple had two daughters.

Elwin Busch, then a captain, died in combat in June 1967 when his plane was shot down during the Vietnam War. Sadly, Captain Busch's brother, Lt. Roland Busch, Jr., had died six years earlier in 1961 when his Navy plane crashed in an accident off the coast of California. Lt. Busch had previously survived 17 months as a prisoner of war during the Korean War.

After her husband's death, Earlene Busch returned to school in Colorado and completed her doctorate in communications in 1980. She founded Information Access Systems, Inc. (IAS), in May 1982. As discussed in the episode, Busch first came to public attention when her expert system was used as part of the investigation into the Green River serial killings in Washington. Lawrence E. Lewis, an officer with the Fullerton, California, police department, expanded upon IAS and Busch's role in the case in a 1988 paper:

> In January of 1984, the King County Washington Police Department formed the Green River Task Force to apprehend a serial killer wanted for the murder of at least 27 young women. The case involved more than 2,000 suspects and 300,000 pieces of evidence. The amount of information generated was immense, particularly as the number of victims increased to 42. A decision was made to try and locate a computer system that could handle this information in an intelligent way, that could be queried in natural language, and that could have the abilities of an expert system. A company called Information Access Systems (IAS) from Boulder, Colorado, was selected as it had developed an expert system that used natural language. The system was called Judgment Space (J-Space). At the time the system operated

> only on a specific type of minicomputer and cost approximately $200,000, not including the labor cost, for a year’s worth of data input.

Lewis said that J-Space did not actually solve the Green River murders but was “successful in organizing the information” and represented “a step for law enforcement in terms of using expert system technology.” (The Green River killer was arrested in 2001 due largely to DNA evidence and subsequently pleaded guilty to 48 counts of murder.) Lewis added that Busch had also sold a new expert system to the Colorado Bureau of Investigation, which I believe was the *Probe One* that we saw in the *Computer Chronicles* demo.

Busch ran IAS as a private company for approximately 20 years. She changed the name of the company to Circa Logic, Inc., in 1998. Sometime around 2000, she sold the company’s expert system technology and retired the business as an active concern. (The company continued to exist on the Colorado books until 2010.)

It was around the turn of the century that Busch decided to embark on a new career as an innkeeper and chef. In 2000 Busch traveled to Cape Breton, an island that forms part of the Canadian province of Nova Scotia, to pick up some maple furniture she had ordered from a local artisan. Busch decided she loved the area so much that she decided to build an inn on the island.

More than two decades later, Busch still owns and operates the Chanterelle Inn. She also decided to train as a chef so that she could run the inn’s restaurant, 100km, which serves locally grown organic food. Busch gave an interview last September to a local Cape Breton website where she discussed how her business was coping with the COVID-19 pandemic.

“Cheers” Actor’s Father Was Contract Killer in 1979 Assassination

Stewart Cheifet’s interview with the FBI’s William Bayse mentioned a murder case involving a Texas judge but did not go into detail. So here’s the back story. On May 29, 1979. U.S. District Judge John H. Wood, Jr., was shot and killed near his home in San Antonio. Wood was the first federal judge to be killed in office since 1867.

Time magazine reported in 1982 that Judge Wood had been scheduled to preside over the trial of Jamiel Chagra, a reputed dealer in illegal narcotics. Given that Chagra faced a life sentence if convicted of drug trafficking–and Wood had a reputation for handing out maximum sentences–Chagra allegedly paid another man, Charles V. Harrelson, $250,000 to shoot and kill the judge. Harrelson had been convicted of an earlier contract killing in 1973 and paroled in 1978.

Harrelson claimed that he was 270 miles away in Dallas when Wood was killed in San Antonio. As Bayse mentioned to Cheifet, the FBI managed to shoot that alibi down using computer analysis. But the key evidence apparently came from Chagra's brother, who agreed to testify against Harrelson and several other co-conspirators (except Jamiel) as part of a negotiated plea agreement. Harrelson was ultimately tried and convicted of Wood's murder and received a life sentence. Jamiel Chagra was acquitted of the murder–at a trial presided over by future FBI director William S. Sessions–but convicted on other charges.

Coincidentally, when this *Chronicles* episode aired in early 1986, Harrelson's son, actor Woody Harrelson, was in the middle of his first season on the NBC comedy series *Cheers*. Woody Harrelson told *The Guardian* in 2012 that while he'd been estranged from his father since childhood, he nevertheless "spent a couple of million" dollars in an unsuccessful effort to try and get him a new trial. Charles Harrelson died in prison in 2007.

Notes from the Random Access File

- This episode is available at the Internet Archive and had an original broadcast date of January 14, 1986.
- William A. Bayse (1937 - 2004) worked as a research engineer for NASA and in several positions with the Department of the Army before joining the FBI in 1978. After leading the computerization of the FBI as an assistant director during the 1980s, Bayse was named the

Bureau’s chief scientist in 1993, the first non-agent to hold that position. He retired the following year. Bayse died in 2004 after suffering from Alzheimer’s disease.

- John Van De Kamp (1936 - 2017) served as Los Angeles County District Attorney from 1975 to 1981. In 1982, he was elected Attorney General of California and held that post until 1991. Van De Kamp unsuccessfully sought the Democratic Party’s nomination for governor of California in 1990, losing a primary election to Dianne Feinstein (who lost to Republican Pete Wilson in the general election). Van De Kamp later served as president of the California State Bar from 2004 to 2005. He died in March 2017 at the age of 81.
- Steve Port served more than 30 years with the Hawthorne Police Department in Los Angeles County. He became Hawthorne’s chief of police in 1989 and held that post until his retirement from the department in 2006. He later served as the interim chief of the El Camino College Police Department.
- Sargent Aubrey Parrott was a San Jose police officer for 57 years. According to a 2018 profile in the *San Jose Mercury News*, Parrott worked his last shift in October 2018, having spent 32 years as a full-time officer and another 25 as a reservist. It was believed that Parrott was the longest-serving police officer in San Jose history.
- There wasn’t much available information on Command Data Systems. The company was based in Dublin, California, and apparently formed around 1978. In June 1989, Denver-based US West, Inc., acquired Command Data Systems through one of its subsidiaries. US West was one of the “Baby Bells” and later merged into Qwest Communications International, which later merged into CenturyLink, which is now known as Lumen Technologies, Inc.
- Search Group, Inc., also known as SEARCH or the National Consortium for Justice Information and Statistics, is a nonprofit organization founded in 1969 to develop technologies related to criminal records. SEARCH is funded primarily by the federal and state governments.
- *Murder by the Dozen*, the program demoed during the studio introduction, was developed by New York City-based BrainBank, Inc., an early edutainment company, and first published by CBS Software in 1983.

- IBM did not release *TopView* 1.1 until June 1986.
- Just a couple of weeks after Stewart Cheifet mentioned the Pixar computer during “Random Access,” deposed Apple co-founder Steve Jobs would purchase the computer graphics division of LucasFilm and organize it as an independent company, Pixar, Inc.
- Despite the novelty of computer-generated effects, the movie *Young Sherlock Holmes* was a commercial flop in the United States, only grossing $18 million domestically. Roger Ebert, the longtime film critic for the *Chicago Sun-Times*, gave the film a three-star review, noting of the stained-glass sequence, “The elaborate special effects [] seem a little out of place in a Sherlock Holmes movie, although I’m willing to forgive them because they were fun.” He quipped that Holmes should have ended the film by deducing the “eventual invention of computers.”

Chapter 16: QuoTrek, Spear Securities, Signal, Dow Jones Information Service, and the Telescan Analyzer

The major theme for this season of *Computer Chronicles* has been, “Why would anyone actually buy a personal computer?” This next episode from February 1986 looks at one reason–managing your investments. After all, if you have enough money to invest in the stock market, you probably had the disposable income to purchase expensive hardware and software to keep an eye on those investments.

Would You Trust a Computer with Your Money?

Stewart Cheifet and Gary Kildall opened the program with a short demonstration of *Wizard of Wall Street*, a stock market simulator from Synapse Software. Cheifet noted that while this was a game, more and more real investors were using their personal computers to manage their portfolios and conduct transactions from their homes. Would Kildall trust a computer to tell him how to invest his money? Kildall quipped he’d like to see the results of the advice first. He added that if we all followed the advice of a single computer program, it wouldn’t lead to a very interesting market. On a more serious note, he said there was a lot of value in online services, such as instant stock trading and historical stock information. He would even use a simulator like *Wizard* to learn more about the market and its terminology.

Lotus QuoTrek Let Users Invest from Home

Wendy Woods presented two reports in this episode, both of which featured investment products from Lotus Information Network. This first report profiled John Eckrich, a stay-at-home investor who used QuoTrek from Lotus. Woods said Eckrich wasn’t the typical example of a stock market investor. Instead of working in an office or on the stock exchange floor his toolkit consisted of the QuoTrek, a portable stock quote receiver, together with his personal computer.

Woods said Eckrich gave up his traditional brokerage practice when he realized that he could invest for himself at home, freed from the burden of clients and commuting, in exchange for a few other responsibilities. (There’s footage of Eckrich playing with his infant child as he worked on his Compaq Portable.)

Woods noted that Eckrich had not cut all communications to his full-service broker but he did most of his research at the computer, which gathered data from online services, tracked and updated the stocks in his portfolio, and charted the performance of selected stocks over time. About the only other things on his desk were a newspaper and the QuoTrek, which provided real-time stock quotes. The online services associated with the QuoTrek cost about $250 per month. In exchange, Eckrich had a real-time link to the trading floor.

Eckrich told Woods that he did have a few regrets. When you worked alone from home and didn’t have co-workers around, he said, some of the feedback was missing. That was why he still had a standard broker.

The “ATM Machine for the Brokerage Industry”

Charles Spear and John Frierson joined Cheifet and Kildall in the studio. Spear was the founder and CEO of Spear Financial Services, Inc., a discount brokerage in Los Angeles. John Frierson was president of Investek in San Francisco.

Kildall opened by asking Spear how computers were now helping small investors. Spear said the computer was the “ATM machine for the brokerage industry,” because it put in the hands of consumers a wealth of information that was never there before. And it gave such investors access to the market so they could do automated trades.

Spear then showed his company’s online service, Spear Securities. He explained you could use the software to access quotes, look at your portfolio (updated to the second), examine tax records, and make trades. Cheifet asked for a specific demonstration, say, to decide between investing in Apple or Lotus. Spear said his system included a database of about 3,300 companies, and users could compare about 50 different items in a variety of ways (e.g., company-by-company, industry groupings, et al.)

Spear then provided a live demo. The Spear Securities software worked with The Source online service. The database was provided by Media General’s *Stockvue* service. This enabled the user to see a stock analysis of Apple and Lotus. For example, you could see how the two stocks performed relative to one another over the past week.

Cheifet asked if you could see any “insider” transactions involving a stock. Spear said you could and provided a demonstration of that feature. The system showed the number of shares bought or sold by company insiders.

Spear then made a stock transaction using Spear Securities online. He noted this product supported a market that operated 24 hours a day. He said you could make a transaction at any time of day and it would still go through, as long as it was a New York Stock Exchange-listed stock.

Kildall turned to Frierson and asked how this technology affected the local broker. Frierson said the local brokers were threatened to some extent by the “electronic revolution,” because it put information in the hands of ordinary investors that was once the exclusive area of the broker’s expertise. Today, you found investors shopping to find the lowest transaction costs. And there were significant savings, often as high as 75 to 85 percent less than standard, full-commission brokerage fees.

With that cost savings, Frierson said, investors could purchase software and tap into databases that fit their own particular interests and needs. He added that investment software was probably the one area for home computer usage that really offered a genuine service. He said there were 40 million investors who as a group had a higher percentage of home computer ownership. And this was one area where it actually paid for them to use a computer.

Kildall asked if that savings factored in the cost of dialing up an online service and paying access charges. Frierson said he was. On average, an investor wouldn't run-up more than $50 per month in such charges. They would make that money back many times over with the savings on commissions.

Wireless Data on Your FM Dial

Wendy Woods presented her second report on a Lotus Information Network product, this time *Signal*. She said this was a new kind of delivery system for time-sensitive investment data. Unlike most services that offered up-to-date stock and commodity data through the phone lines, *Signal* picked up this data from an FM-radio sub-band via a receiver plugged into a personal computer's serial port. Up to 250 user-programmed issues could be constantly monitored and changes were then displayed on the PC's screen.

Jim West, president of Lotus Information Network, told Woods that *Signal* was a continuous system so that updates came second-by-second as transactions occurred throughout the day. Even when the computer was off, the *Signal* receiver maintained the information in a background mode and continued tracking the user's portfolio–even alerting the user if certain preset changes occurred.

Woods said *Signal* ran out of a computer facility in Burlingame, California, which gathered live quotes on 23,000 stocks from various exchanges. From this center, the information was then transmitted via satellite to 12 FM radio stations throughout the country. The proprietary technology then allowed individual users to download the data into their PC and use it with other Lotus products, such as *Lotus 1-2-3* and *Lotus Symphony*.

Woods noted that *Signal* had only been out for a few months, and while Lotus refused to divulge sales figures, the company claimed it had sold "beyond their expectations."

Would Computers Completely Replace Brokers?

Back in the studio, Kildall asked John Frierson about the Dow Jones News Service, which was one of the earliest ways to receive stock quotes online. Frierson said Dow Jones was one of “the pioneers” in this area along with The Source and Compuserve. These companies brought together information–at high expense to them–to develop databases that users could tap into. He added this was all a result of the “unbundling” that occurred in the brokerage industry about 10 years earlier. This was a transition from the old, high-commission structure to one where an investor could buy transaction services separately from information services.

Frierson then demonstrated the Dow Jones service. He explained this service didn’t just include stock and investment information but also tied-in other items such as world news and sports–even shopping and airline reservations. Kildall asked if Dow Jones was a good place for individual users to start. Frierson said it was given that it was relatively cheap to use a service like Dow Jones or a similar product like Spears Securities or Charles Schwab’s *Equalizer*. He noted that many online services included an hour or two of free access to Dow Jones.

Frierson showed one aspect of the Dow Jones service that allowed users to “tap into” what top brokers were saying about stocks. For example, you could pull up a number of analyst reports on Apple from the past several months. The user could then download individual reports.

Kildall pointed out that the value of a broker was that they assimilated a lot of this information for the investor. Frierson said there were two kinds of people. The first was someone who turned over their investment decisions to a professional. The second–which included a lot of computer users–were those people who liked to handle things themselves but until recently lacked the tools to manage their own investments. Now, those investors could access the same real-time data as any professional broker. Frierson said it was exciting in that a person could sit at home and be a part of the international financial community on an equal footing.

Cheifet asked Charles Spear just how much money an investor could save using these types of services and investing online. Spear said this approach to the business had a radically different economics to it than traditional brokerage. Basically, every PC was now a branch office. And since a brokerage like his didn’t require the same number of physical branches, their commissions tended to be 85 to 90 percent of those of a traditional kind of discount broker–and 25 to 30 percent of what you would pay a traditional full-service broker.

Spear added that while this system may threaten the way that brokerage services were delivered, if you had a broker who gave you advice and helped you make money, then you found the most valuable resource in the business.

Analyzing Stock Valuations

Richard Carlin of Telescan, Inc., joined Cheifet and Kildall for the final studio segment. John Frierson also remained at the table.

Kildall asked Carlin for a demonstration of his company’s product, *Telescan Analyzer*. Carlin explained the product allowed users to look up historical stock information and display it on their computer screen. Basically, it displayed graphs of stock history. He showed a sample graph of the Dow Jones Industrial Average dating back to 1973. He noted that the Dow had been flat for many years before suddenly taking off in 1982 and hitting all-time highs. However, the *Analyzer* could also adjust for inflation, and when doing so, the graph now showed the market was not really hitting all-time highs but just starting to turn around after a long period of decline in real terms.

Kildall clarified that *Analyzer* connected to another computer system through a modem. Carlin said yes, it connected to Telescan’s own database in Houston, Texas. The data was then transmitted to the local computer and displayed as the graph.

Cheifet asked if the *Analyzer* could look at insider trades. Carlin said you could. He pulled up a sample graph using data from Toys ‘R’ Us. The top two-thirds of the graph showed the historical stock price data. The bottom third showed the history of insider trading–net buying and selling by corporate officers–over that same period. Carlin claimed his service was the only one that provided such information in this way. He pointed out the

Toys ‘R’ Us graph showed net buying at every major low point in the stock price, and net selling at every major high point. So by following the insiders, you could make money on that stock.

Cheifet asked about the valuation of a stock–whether it was over- or undervalued. Carlin said *Analyzer* could look at up to five fundamental values–dividends, earnings, cash flow, capital spending, and sales–and converted it into another graph. Carlin showed Kellogg’s as an example. Essentially, Carlin claimed a user could look at the final graph and understand whether that particular stock was overvalued or one to watch.

Cheifet asked for an example of an undervalued stock. Carlin displayed a graph of National Semiconductor. He said that *Analyzer* found this particular stock was undervalued right now.

Cheifet asked Frierson if there was any software that could function as an “expert system” and could actually tell an investor what stocks to buy. Frierson said the technology was there but we were still a few months away from seeing an actual consumer product along those lines. Frierson said such systems would allow the user to put interpretive skills–either their own or that of an expert–to help in the screening or selection process for picking stocks. Investing will always be an art rather than a science, he said, but with the new exposure to artificial intelligence in the next generation of software, it would enhance the home investor’s experience.

“Equal Time” for Gambling and Stocks?

I think George Morrow’s closing comments warrant a full recitation:

> Isn’t it marvelous? A seat on the stock exchange right in our own den. And all through the magic of the microcomputer. Millions of us investing our IRA savings with a click of a switch. And what better timing? The third major bull market of the century. Think of the fortunes to be made! Think of the bankruptcies to come.
>
> The last two times we succumbed to the lure of Wall Street it was very exciting–and profitable–until market bears came in and wiped it all out

with the swipe of a paw. And this time we're deeper in debt than ever before as consumers. There's only two sure ways to profit in stocks: Buy carefully and hold on for years if necessary, or be the agent that conducts the trade.

Unfortunately, the rest of us lose most of the time, and a lot of it is very much like gambling. In fact, if I were head of the Gaming Commission in Nevada, I'd be demanding equal time on all these computers to bring our games of chance to your den as the brokerage houses are bringing you theirs. After all, we're both after the same thing–your money.

French Computer Expert Advises U.S. to Place "Bombs" in Software Exports

Stewart Cheifet presented this episode's "Random Access," which was recorded in February 1986.

- The IRS was again plunging into the risky waters of computerization. This time, the agency was experimenting with online filing. H&R Block and five other tax preparers were authorized to file their clients' 1040 forms electronically in three test markets: Raleigh-Durham, Cincinnati, and Phoenix. Cheifet said the online filing would only be available to taxpayers claiming a refund. W-2 forms and taxpayer signatures would still have to be sent by mail.
- Researchers at Carnegie Mellon University were using 25 of the new IBM RT PCs as part of a campus network for several months. And the RT got good grades, Cheifet said. One of the RISC machine's features was a 40-bit virtual memory chip that provided up to 1 trillion bytes of user memory.
- Apple now said the "open Mac"–i.e., a Macintosh with internal expansion slots–would not be available in 1986 as promised. Cheifet said the open Mac was now projected for release in 1987.
- Microsoft and Lotus agreed to work together on new applications that incorporated Microsoft's Windows interface. Ashton-Tate and several

other software companies said they were also developing new products to take advantage of Windows.
- The U.S. Senate Finance Committee began hearings on a tax reform bill. A House version of the bill maintained research and development tax credits favored by the tech industry. But Cheifet said the industry was concerned about the tax credit’s fate in the Republican-controlled Senate.
- French computer expert Thierry Breton urged the United States to put “soft bombs” into sophisticated software to prevent the Soviet Union from using such programs for military purposes. Breton said while it was easy to control the export of computer hardware, it was virtually impossible to control the export of software. The only defense was therefore a “soft bomb” that could blow up a program if it was used in an unintended way.
- A New York-based company, Dataport, planned to build a 2.5-acre “data vault” underneath the bedrock of World Trade Center, which would store backup data for financial companies.
- Supermarket shoppers in Williamsport, Pennsylvania, were carrying little plastic cards to facilitate market research into what people were buying. The computerized system recorded actual purchases, as opposed to an older system that relied on shoppers keeping diaries. Cheifet noted that the diaries were often inaccurate. For instance, only one-third of customers who said they purchased Kellogg’s Frosted Flakes actually bought them.

Telescan Co-Founder Appeared on *Chronicles* as Company Teetered on Verge of Bankruptcy

Stewart Cheifet introduced Richard Carlin as the president and CEO of Telescan, Inc. But Carlin’s position was actually quite tenuous when he appeared on the show. Indeed, in the few weeks between the taping and broadcast of this episode, Telescan nearly collapsed into bankruptcy.

Most of what we know about Telescan’s history comes from a 1997 opinion from the Texas 14th District Court of Appeals, *Hoggett v. Brown*. Hoggett and Brown were Carlin's partners in Telescan. But that partnership would descend into over a decade of litigation.

Carlin met Derek Hoggett in 1978. At the time, Carlin was completing a doctorate in biochemistry at the University of Houston and would start a fellowship at Rockefeller University in New York City. He also dabbled in stocks. Hoggett was a stockbroker, and the two men became friends and started trading stocks together.

Four years later, in 1982, Carlin approached Hoggett with a program he'd written to retrieve and analyze stock information. This would eventually become *Telescan Analyzer*. Carlin thought his software might be a viable product but he lacked the time or money to make it happen. Hoggett agreed to help him out.

Hoggett formed Telescan, Inc., and financed it with a loan from one of his other companies. Initially, Carlin and Hoggett each owned 50 percent of the company. But Hoggett largely footed the bill, selling his condo and using his other businesses to keep Telescan afloat during 1983 and early 1984.

Carlin's product still was not ready by March 1984. At this point, an intermediary introduced Hoggett and Carlin to David Brown, who was an experienced investor in the tech industry. Brown took out a $500,000 line of credit. The three men then formed a limited partnership called Telescan, Ltd. Brown contributed the $500,000 line of credit as a limited partner. Telescan, Inc., the company co-owned by Hoggett and Carlin, was the general partner. Hoggett served as president and chief operating officer with Carlin remaining in charge of product development.

Telescan quickly burned through the $500,000 line of credit. And there was still no product in early 1985. Brown then helped Hoggett and Carlin obtain a new loan of $750,000. Brown pledged his stock in another company as collateral. Most of this new loan went to pay back the original $500,000 line of credit.

Although Carlin managed to finally ship *Telescan Analyzer* by the end of 1985, the company still had cash flow problems. Brown and Hoggett continued to loan the company money just to meet payroll and basic expenses. Brown had also soured on Hoggett's management of Telescan. In December 1985, he and Carlin voted to remove Hoggett as president of the company. Presumably, this is when Carlin assumed the titles of president and CEO.

As 1985 ended, Telescan's long distance carrier threatened to disconnect its service. That would mean what customers Telescan did have would no longer be able to remotely access the company's database, effectively rendering *Analyzer* worthless. Brown consulted his attorney, who advised him to either cut his losses, put Telescan in bankruptcy, or use a merger to attract additional capital.

On February 3, 1986–the same week as this *Chronicles* episode first aired–Hoggett sent a letter to Carlin and Brown proposing that Telescan file for bankruptcy. Brown and Carlin, however, decided to go with the merger option. Brown formed a new company on February 6, DB Technology, Inc. With Carlin's approval, DB Technology then signed an agreement to acquire Telescan, Inc. Hoggett would not receive any stock in the new company, although he would be eligible for a limited payout from any profits earned by the new DB Technology over the next three years.

Telescan's shareholders formally approved the merger on March 4, 1986, with Hoggett the only dissenting vote. The next day, Hogett sued Brown, Carlin, and various other parties associated with the deal. The defendants then filed their own counterclaims against Hoggett.

Three years later, in 1989, a trial ended in a victory for the defense. But the 14th District ordered a new trial after holding the judge improperly excluded certain expert testimony. The second trial produced a jury verdict for Hoggett and an award of $2.6 million in damages. The judge overruled the jury, however, and held that Hoggett could only recover on three promissory notes reflecting loans he made to Telescan in 1985. He was not entitled to any damages for the alleged breach of contract or other allegations that he made against the defendants.

This time, the 14th District upheld the trial court's decision. By this point more than 11 years had passed since Hoggett's ouster and the DB Technology merger. In the interim, DB Technology sold its assets to another company, Max Ret, Inc., in 1989. Max Ret then changed its name to Telescan. Carlin remained as Telescan's chief technology officer until 2000. Since then he's continued to work as a software developer, most recently with Sensia Global.

In 2001, Telescan, Inc., merged with ZiaSun Technologies, Inc., and formed a new company called INVESTools Inc. (It was really more of a ZiaSun acquisition, as its shareholders received 75 percent of the new company.) Five years later, in 2007, InvesTOOLS merged with Thinkorswim, Inc., and kept the latter's name. TD Ameritrade Holdings, Inc., then acquired Thinkorswim in 2009 for $606 million. In 2020, Charles Schwab acquired TD Ameritrade.

Graduate Student's Wireless Race Tracking Idea Launched Decades of Stock Quote Services

If you think that story was complicated, let's now look at Lotus Information Network Corporation (LINC) and its QuoTrek and *Signal* products. Although these products–or at least their brand names–had a long lifespan, only a short part of it came during Lotus' ownership. In fact, you can learn a lot about the history of the tech industry by examining the following chain of events.

This story began in the late 1960s, when Anthony Fascenda and Rollin Ache first met while both were engineering undergraduates at Drexel University in Philadelphia. Fascenda later attended graduate school at Penn State, where he wrote his master's thesis on Formula 1 racing–specifically, how to design an automatic timing system for races using tiny radio transmitters mounted in the cars combined with embedded antennae around the race track.

Fascenda never finished his master's degree–his employer sent him to work in San Francisco and he was still one class short–but in 1977 he decided to start a company with Ache and a former boss, Daniel Gregg. That company was called Dataspeed, Inc. The original plan was to develop and sell "hand-held timing units" for spectators to use at car races, according to a 1984 article by Neill Borowski in the *Philadelphia Inquirer*.

Dataspeed eventually attracted the attention of a New Jersey-based investment group led by David B. Lockton. a former corporate lawyer who had raised $30 million back in 1967 to build the Ontario Motor Speedway in Los Angeles. Lockton joined Dataspeed in 1981 as its CEO and quickly pivoted Fascenda's technology from racetrack timing to providing real-time stock quotes.

Dataspeed went public in January 1983. A few months earlier, the first news reports appeared about Datapseed's plans. A November 1982 article in the *San Francisco Examiner* said Dataspeed signed an agreement with National Public Radio to create a "new telecommunications services" that would transmit "tock quotes, weather reports, sports scores and news headlines" over FM radio to a special device that would be available by the end of 1983.

The actual device–the QuoTrek–did not arrive until March 5, 1984, when it debuted in Chicago, according to the *Chicago Tribune*. By that point the ambitions had been scaled back to simply providing stock quotes. The original QuoTrek was an 11-ounce handheld device with a 2-inch LCD screen and a full keyboard (it resembled a calculator rather than a QWERTY layout). The user could program up to 40 stocks into memory.

The key to the QuoTrek was the fact that FM radio stations at the time had two additional sub-frequencies. In 1983, the Federal Communications Commission said FM carriers could use these sub frequencies to transmit "computerized data." In effect, QuoTrek's stock quote information piggybacked on the regular FM radio signal.

Dataspeed initially launched QuoTrek in three markets: Chicago, Los Angeles, and San Francisco, with New York City following later in 1984. The *Tribune* noted the effective range of the FM signal was about 40 to 50 miles. By November 1984, Dataspeed reported it was operating in 11 cities.

The actual QuoTrek devices were manufactured in the Philippines by Regency Electronics, Inc., which purchased a 20 percent share of Dataspeed for $9.6 million in August 1983. The QuoTrek was not cheap. The device cost $399 upfront and required a monthly subscription for the FM radio service, which started at $37.50 per month plus other potential surcharges.

Dataspeed publicly stated it needed to sell at least 10,000 QuoTrek units to break even. By September 1984 there were only about 2,000 terminals in use, according to the *Philadelphia Inquirer*. At that point the newspaper said the company's future was "cloudy," with analysts doubting whether an "esoteric" product like the QuoTrek would attract enough users.

Indeed, by early 1985, Dataspeed's debts were mounting. In April 1985, management said the company would go out of business within a month unless it found a buyer. Shortly thereafter, Lotus Development Corporation signed a letter of intent to purchase Dataspeed. The deal became final that June. A Lotus executive told the *Boston Globe* that under the agreement, Lotus basically paid "40 cents on the dollar" to take on Dataspeed's debts. Lockton departed as CEO shortly thereafter although Jim West, the executive seen in Wendy Woods' report, remained in his role as president for some time after the deal closed.

Lotus retired the Dataspeed name and reorganized its new subsidiary as Lotus Information Network Corporation (LINC). Lotus also took over the manufacturing of the QuoTrek, as the Dataspeed acquisition terminated the original agreement with Regency Electronics. LINC also started production of Signal–which had been developed by Dataspeed under the name Modio–to allow users to download stock information directly into a PC. As referenced in Wendy Woods' report, Lotus also signed a deal with Equatorial Communications to package Signal via satellite, which in theory meant the user didn't require a local FM signal to receive stock quotes. (Equatorial ran into financial problems later in 1986, so I don't know if this service was fully implemented.)

Dataspeed was not Lotus' only acquisition in this time period. The company had been on a significant buying binge in 1985 and 1986, as they were in something of an "arms race" with rival Ashton-Tate to see who could diversify their portfolios the fastest. In June 1986, Lotus co-founder and CEO Mitchell Kapor abruptly resigned. At the time, Kapor was considered the major champion of the Dataspeed acquisition. His successor, Jim Manzi, nevertheless reiterated Lotus' commitment to QuoTrek and Signal as products, noting they reflected a "three-to-five year investment."

Well, that investment turned out to be a little over three years. In December 1989, Lotus sold the entire LINC division to Financial News Network, Inc., (FNN), a subsidiary of Infotechnology, Inc., which also owned United Press International. FNN was a cable financial and business news channel launched in 1981. After the sale, FNN merged LINC's businesses, which still included QuoTrek and *Signal*, into one of its own divisions, Data Broadcasting Corporation.

Ten months later, however, the shit hit the fan for FNN. The company disclosed it was in a major financial crisis and struggling to meet its operating expenses. The company's board fired the CEO and brought in Alan J. Hirscfield and Allan R. Tessler as interim co-CEOs. In reality, they were tasked with shepherding FNN through bankruptcy and finding a buyer.

In May 1991, a federal bankruptcy judge approved Hirschfield and Tessler's plan to sell most of FNN's assets, including the cable network, to rival CNBC for $154.3 million. (FNN actually had more viewers than CNBC at the time, so the latter largely adopted the former's programming and style.) Hirschfield and Tessler, however, thought the Data Broadcasting division was still viable. So in June 1992, they used the shell of FNN to relaunch the company under the Data Broadcasting name.

In fact, *Signal* and QuoTrek continued to be improved under the new Data Broadcasting Corporation, although they remained niche products. A November 1995 report in the *Fort Worth Star-Telegram* noted that the latest QuoTrek device now cost $295 and required a minimum subscription of $90 per month. Meanwhile, *Signal* was now being sold as the $450 SignalCard, which plugged into a laptop and required a $160 per month subscription (not including transaction charges). At the time, there were only 13,000 Signal users and 9,000 QuoTrek users nationally.

As the Internet boom took hold in the late 1990s, Data Broadcasting co-launched the financial news website MarketWatch.com in a joint venture with CBS. In January 1999, MarketWatch went public. The initial speculation drove up the stock price for both Marketwatch and Data Broadcasting. But within a week, investors realized that MarketWatch was overvalued. As a result, the *Salt Lake Tribune* noted on January 21, 1999, Data Broadcasting's stock lost 58 percent of its value over a 10-day period.

In September 1999, Data Broadcasting reported a $4.2 million loss despite record revenues, largely due to the collapse of MarketWatch.com's stock.

With its own stock in the toilet, Hirschfield and Tessler decided they'd had enough. Pearson plc acquired a majority stake in Data Broadcasting and merged it with another of its subsidiaries, Interactive Data Corporation (IDC). Data Broadcasting was technically the surviving entity but took on the IDC name. In 2004, IDC relaunched QuoTrek and *Signal* as digital services for Blackberry and other mobile devices. (It appears the last physical *Signal* and QuoTrek devices were sold around 1998.)

In May 2010, Pearson sold its majority stake in IDC to two private equity firms for $3.4 billion. Five years later, in October 2015, those firms sold IDC to Intercontinental Exchange–the company that owns the New York Stock Exchange–for $5.2 billion.

Signal, now known as ICE's eSignal, continues to provide streaming, real-time market data to iOS and Android users for $192 per month. ICE retired the QuoTrek name in 2017 and merged its remaining services into eSignal.

Spear Lost Control of Company as Annuities Proved More Lucrative Than Discount Brokerage

Our third and final tale of corporate intrigue features Charles M. Spear and his eponymous Spear Financial Services. Spear started out as a lawyer in Ohio. In the late 1960s, he took a legal job with a Chicago bank but later transitioned into stocks and bonds. He moved to Los Angeles in 1981 and started Spear Financial Services two years later.

According to a 1989 *Los Angeles Times* profile, Spear took his nascent company public through a reverse merger–basically, he bought an existing-but-worthless public company and gave it his name–and raised $3 million in capital. Initially, Spear focused exclusively on providing brokerage services to investors with personal computers. He was among the first to do so but the market grew slowly, forcing him to offer "traditional discount broker" services according to the *Times*.

As Spear discussed in his *Chronicles* appearance, one of his innovations was offering home investors the ability to trade stocks 24 hours a day. But as the *Times* explained, “Such off-exchange ‘third-market’ trading [was] mainly reserved for large institutional investors.” The New York Stock Exchange eventually “forced Spear to abandon his service, and Spear acknowledged that it drew few customers anyway.”

In 1988, Spear purchased James Mitchell & Co., by assuming $2.2 million in debt. Mitchell’s business was selling annuities and other insurance-based investment products. Under the deal, James Mitchell himself would acquire additional Spear stock based on performance. Spear told the *Times* in 1989 that Mitchell “likely will end up owning a bigger stake in [Spear Financial Services] than he does.”

That is apparently what happened. In December 1992, Spear resigned from his own company. By this point, Mitchell’s annuity business accounted for more than two-thirds of Spear Financial Services’ total revenue. James Mitchell took over the company, sold off the brokerage businesses, and continued his annuity business under the name of the JMC Group. (There’s a bunch of stuff that happened to JMC Group since 1992, but it’s not especially interesting and this post has gone on long enough.)

Notes from the Random Access File

- This episode is available at the Internet Archive and has an original broadcast date of February 4, 1986. Based on the in-studio product demonstrations, the program likely taped on January 11, 1986.
- Despite the name, The IBM RT PC was not part of its Intel-based Personal Computer line but rather a workstation based on the Reduced Instruction Set Computing (RISC) architecture. According to the Crummy Computers Wiki, a typical RT/PC configuration cost about $20,000. The machines were never a big seller for IBM, which produced them between 1986 and 1991.
- Apple released its first “open architecture” Mac–the Macintosh II–in March 1987, a little over a year after this *Chronicles* episode aired.
- Thierry Breton is currently France’s member of the European Commission, where he serves as Commissioner for Internal Market.

He previously served as France’s finance minister during the presidency of Jacques Chirac.

- Paul D. Catalano founded Dataport in 1986. He previously ran two other data storage companies based in New Jersey. Catalano told the *New York Times* in November 1985 that approximately 50 companies were interested in using his World Trade Center data vault when it became operational in 1986. But I could not find any information on whether the vault ever opened. Catalano died in 1991 from cancer and Dataport ceased operations in 1993, according to New York State records.
- Synapse Software, the company behind *Wizard of Wall Street*, has its own fascinating history, which I’ll address in the next chapter.

Chapter 17: Mind Over Minors, Relax, and the Therapeutic Learning Program

“Expert” systems were all the rage in the late 1980s, as demonstrated by a previous *Computer Chronicles* episode on their use in law enforcement. But expert systems tended to be expensive–costing tens of thousands of dollars–and thus only available to businesses and institutions. Yet by 1986 there were efforts to market lower-end systems to individual consumers. This next *Chronicles* episode from February 1986 looks at the meeting of the minds, as it were, between expert systems and another mid-1980s boom market: pop psychology and the self-help movement. Stewart Cheifet and Gary Kidall opened the program by looking at *IntraCourse*, a program running on an IBM PC. Cheifet said the program’s authors claimed it could help couples with “sexual compatibility or incompatibility problems.” Cheifet prepared a profile of a fictional couple, answering about 100 questions posed by the software, which then produced a series of charts and a “compatibility percentage” based on 12 different characteristics.

Cheifet noted this was just one example of the host of “psychological software” that was now out on the market. But how could a dumb, number-crunching computer do anything useful with regards to human behavior? Kildall said that computers had been used for years to tabulate scores from “objective” tests like personality inventories. When it came to non-objective programs like *IntraCourse*, they might be a lot of fun but there was a real question about how valuable computer analysis was. But he said it might be possible to use “expert” or rule-based systems to get some answers.

Using Cognitive Software to Help Trauma Victims

Wendy Woods' first report focused on the use of computers by doctors to treat patients recovering from severe head trauma. Woods said such patients typically required lengthy rehabilitation to try and regain basic cognitive functions. Exercises to improve concentration, memory, or motor skills involved repetitive games administered by the therapists. But computers were changing cognitive therapy, often with impressive results.

Woods said that mental exercises most suited to head injury patients were easily adapted to a computer program. Specialized software like a program developed by the Karen Lambert Foundation helped patients to redevelop lost cognitive skills with logic-based games. (The name of the program was apparently *Memory Master*.) Doctors didn't expect computerized routines to replace therapists, who sat by patients during sessions, but in some cases patients could work by themselves. And the challenge of keeping up with the computer kept them motivated.

The program also seemed to provide patients with a tactile sense of their own progress, Woods added. As they advanced in the program, head injury victims increasingly felt their diminished capacities. So a program that could gauge their own progress was psychologically stronger.

Leading a brain-injured person back into the mainstream of life called for a combination of physical and psychological therapy, Woods said. While still in an early stage, cognitive software seemed to be making a difference. Rehabilitation centers could use their staff more efficiently, and most importantly, patients could go home sooner.

Helping Parents Prepare Personality Reports on Their Children

Dr. Jim Johnson and Dr. James Gardner joined Cheifet and Kildall in the studio. Johnson was a psychologist and president of Human Edge Software. Gardner was a psychologist with the Fairview Developmental Center in Orange County, California.

Kildall asked Johnson if it was really possible to use a computer program to get meaningful results from a subjective analysis of someone's behavior.

Johnson said you could do a surface-level analysis with a computer. It couldn’t do the same thing as a professional. But you could do more in an interactive mode as opposed to a book.

Gardner said he was more cautious. His center also used computers, but they spent a great deal of time assessing the validity and accuracy of the data before it was entered. And they didn’t run a program unless that information was reliable; if it was not, they required people to go back and change the inputs until they reached a certain level of accuracy.

Kildall noted that the software Gardner referred to was used by professionals, while Johnson’s programs were marketed towards consumers. Kildall asked Johnson for a demonstration of one of his programs, *Mind Over Minors*. Johnson explained that with *Mind*, a parent assessed themselves and their child, and then the program gave the parent a report. The idea was to categorize both parties and then “tailor down the strategy” for how the parent could better interact with a child.

Mind presented the parent with a list of roughly 50 adjectives to describe them and their child, such as “anxious,” “bossy,” and “active.” The parent then entered whether or not they “agreed” or “disagreed” that the adjective described the relevant person. Johnson prepared sample profiles for his demo. He then showed the final “Strategy Report,” which also referred to a book that accompanied the program. The first part of the report offered a general description of the parent and child based on the responses to the various adjectives. Then it provided specific advice to parents regarding techniques they could use with their children. Johnson claimed that the software had “boiled down the expert literature” related to parent-child interactions and only offered the advice that was relevant.

Kildall asked if the technology behind *Mind* was based on a more professional system. Johnson said yes, there were about 5-to-10 man-years put into *Mind*. (Johnson lamented it took a lot longer than he thought it would.) To build the program they had to go through a lot of expert books and research. He explained the final program was “useful to parents” but still cautioned that there was a “tongue-in-cheek attitude” with this type of software. Nevertheless, Johnson said he was a former professor and scientist, so he wouldn’t put out anything that didn’t involve a good deal of research.

Kildall asked Gardner for his opinion of *Mind*. Gardner said it was a valuable tool for people to deal with non-serious problems. But the kind of work he did involved people with severe aggression and self-abuse. The kind of software necessary to deal with those problems required 2,000 bits of information as opposed to 50.

Kildall followed up, asking Gardner if the software he used was widely utilized by other psychologists. Gardner said yes, it was used by people in mental health centers, group homes, schools, and state institutions. The software provided the equivalent of going to a university and getting 24 disciplines to sit down for a week and tell you what was going on with the patient.

Cheifet asked Gardner to elaborate further on the “expert system” he used. Gardner said the program dealt with about 5,000 “rules” that were extracted from the professional literature on a variety of subjects such as medication, nutrition, and physical health. The program then used an artificial intelligence module that could change the rules based on experience. So the program actually adapted itself over time to the environment where it was used.

Cheifet asked about the potential risks of people getting the wrong type of advice from these programs. Gardner said they spent about one-third of their time ensuring the information provided to the software was accurate. Indeed, the program wouldn’t even run unless it had reliable, valid, and accurate information. The reason for that was to minimize those risks.

Johnson added that over the years experts had often given conflicting advice, especially with respect to subjects like child-rearing. He said with respect to his own products, he tried to do the best he could by trying to tailor advice based on the available research as opposed to simply offering generic advice. So he saw the computer as an improvement rather than a danger.

Kildall asked Johnson what the professionals in his field thought about his software. Did they see it as a threat? Johnson said reaction was mixed. The whole issue with AI was that once you developed a system that in some way mimicked an expert, they started to feel threatened.

This Was Perhaps the Silliest Thing They Made Wendy Do for This Show

Unlike most of her remote segments, Wendy Woods took a more hands-on approach with this next report from the Biofeedback Institute in San Francisco. More precisely, she took a *head-on* approach, using a headband equipped with tiny sensors to "control" a computer program called *Relax*, developed by Synapse Software.

A woman with dark curly hair and glasses is seated in a chair. She is wearing a large black headband and has a bored expression on her face.

Dr. George Fuller Von Bozzay, a psychologist and director of the Biofeedback Institute in San Francisco, used a Commodore 64 equipped with an interface box and special software (including *Relax*) to conduct his biofeedback work. Von Bozzay told Woods that biofeedback software could now be used with most people who had psycho-physiological disorders. For example, a patient could learn by watching the video screen and see where their heart pressure, blood rate, or muscle tension was and learn how to "vary" those meters or other graphics on the screen.

Woods explained–and attempted to demonstrate–that in one part of the *Relax* program, the patient tried to lower a balloon on the screen by relaxing. The program also included a kaleidoscope that increased in complexity and beauty as the patient became more at-ease. And there was also a graph that "more scientifically showed" a patient's progress.

Woods said Von Bozzay used another program to monitor a variety of body functions visible on the screen. He said the "real key" to biofeedback was the process, not the machine. So the more the machine distracted the person from the learning procedure, the less learning that took place.

But how well did it work, Woods asked? Von Bozzay said he was pleased with his patient's progress. And Woods herself said–perhaps facetiously–that she "looked pretty relaxed."

The Dangers of Software Psychology

Dr. Roger Gould and Dr. Bernie Zilbergeld joined Cheifet and Kildall in-studio for the final segment. Gould was a psychiatrist and president of Interactive Health Systems in California. Zilbergeld was a psychologist and author.

Kildall asked Zilbergeld, a critic of the use of computers in psychology, about the danger of using software in place of a traditional therapist. Zilbergeld said there were quite a few possible dangers. He specifically called out Jim Johnson's *Mind Over Minors* from the previous segment as raising a number of problems. Essentially, Zilbergeld said the program was a "toy" with nothing scientific behind it. He had no idea why someone would pay $50 for a program like that as opposed to buying a paperback book for $3 or $4 with the same information. If parents saw *Mind* as a gimmick or something to play with, that was fine. But he was concerned that some people might take it seriously. On the other hand, he said the database described by James Gardner had some interesting possibilities. We wouldn't know for sure until it was tested, Zilbergeld said, but it certainly accounted for more variables than any human therapist could keep in mind at any one time. So he'd like to see further research in that area.

Cheifet then turned to Gould and asked him to explain his software, the *Therapeutic Learning Program* (TLP), which was used in group therapy settings. Gould said most people went to a therapist for short-term work because they had some problem, or symptoms that were secondary to a problem. And it was easy to identify the source of a problem: A person was in some state of dissatisfaction and uncertain how to act. Once you were sure and determined the right course of action, that dissolved the problem. So his program was organized so you could take any problem and begin to ask the question, "What might I do better or different?" And was that the right thing to do? This question had two levels: First, was it the right *choice*. Second, was it right for the person psychologically?

Gould said TLP was used in connection with a mental health clinic, a psychiatrist's office, or even a wellness program. In the room there would be 10 computers, one therapist, and 10 patients. The computer asked each patient a series of questions designed to identify their specific problem or dissatisfaction. He showed a sample screen that asked the patient to select one or more items from a list of sentences starting with, "I'd like to…" For example, one of the options was, "I'd like to be on time with my appointments and other commitments." The idea was to identify those items that addressed the patient's specific problem.

Kildall asked what the program actually did with all of this information. Gould said the program continued to guide the patient's thinking process. But there was no prescription or evaluation. Kildall asked about the actual results in group therapy. Gould said he'd used his program with about 1,000 patients so far, and about 75 percent of them had acted on their problem after completing the therapy program, which lasted a total of five sessions. Gould said this "alternative method" was much more effective than what therapists like him had been doing previously. He said this process was also more useful for the patient because it increased their self-esteem and rendered the role of the therapist less important.

Cheifet asked Zilbergeld for his thoughts on this. He said Gould's work sounded interesting. But he said the outcomes had to be taken with a grain of salt. You could take any therapist from any school who could say the same thing. The real proof–and he said Gould knew this–was in comparative outcome studies. The real research had to be done by someone else, so we would not have answers until several years down the road. Without such research, Zilbergeld added, you just had a lot of wild claims. For instance, some people said computers would lower the price of therapy, but Zilbergeld said it was equally likely it would raise prices. After all, computers were not that cheap, especially if you had to buy lots of them.

Kildall asked if a really good "expert system" would be of genuine help to a therapist. Zilbergeld said he understood Gould's program as an attempt to automate some of the therapist's work. Nothing Gould said concerned him that much. But in broader terms, using computers didn't make anything more scientific. Gould interjected that his system reflected about 80 years of clinical experience by three professors of psychiatry.

Could Computers Make Competent–if Not Expert–Therapists?

George Morrow's closing commentary focused on what he called the "flagrant abuse" of the word "expert" in conjunction with expert systems. He said it was one thing for programmers to abuse the word. It was quite another for psychologists to do so. You would expect someone who understood human behavior to have more common sense.

He noted an expert was someone (or something) who understood a subject so well that their responses were automatic and based on patterns rather than rules. Experts knew that rules had to be broken some of the time. Knowing when was the difference between "expert" and "competent." Given our limited understanding of how the human mind worked, Morrow said nobody should claim to be a genuine expert. Otherwise, therapy wouldn't be so hit-or-miss. So in theory, a computer could do as well as a human therapist, at least when it came to helping a patient discover how to solve their own problems.

Commodore Received Loan Extension, Kaypro Axed CP/M Models

Stewart Cheifet presented this week’s “Random Access,” which he recorded in February 1986.

- A research study by the Swedish Occupational Safety Administration found that radiation from video display terminals caused birth defects in the fetuses of laboratory mice. One researcher cautioned, however, that you could not necessarily draw conclusions about humans based on these results. But we couldn’t rule out the possibility that radiation from video displays could harm human fetuses.
- Commodore received a one-month extension on a deadline to come up with a plan to pay back nearly $200 million in outstanding bank loans. A Commodore spokesman claimed that Amiga sales during the last quarter should give Commodore its second-best quarter in company history.
- Kaypro said it would eliminate several of its computer models in an attempt to return to profitability. The discontinued models included the Kaypro 1 and the Kaypro 10, both of which ran CP/M, and two versions of the Kaypro 286i. Kaypro said it was also adding a new version of the Kaypro PC (a PC-XT compatible) with a 20 MB hard drive, which Cheifet said would retail for $1,895.
- The U.S. Senate Judiciary Committee heard testimony on a bill to make the FBI’s National Crime Computer accessible to college campus police departments. Cheifet said the ACLU opposed the bill, noting that 5 percent of the FBI’s records contained erroneous information, which had led to false arrests.
- Several computer experts warned that the major problem in computer security was not outside “hackers” but corporate insiders. One industry executive said that despite the publicity given to hackers, only 5 to 10 percent of computer crime was committed by hackers. The rest was the result of careless internal security.

- The Internal Revenue Service said its upgraded computer system was working just fine so far. The latest report said the IRS processed four times as many returns as it did by the same time last year.
- Paul Schindler reviewed *Volkswriter 3.0*, (Lifetree Software, $300), a word processing program.
- The Soviet Union's TASS news agency announced it would publish its English-language newswire online via CompuServe.
- Three teams of MBA students–from Stanford, Harvard, and the University of Pennsylvania–participated in a competition where they each played *Wizard of Wall Street*, a stock market simulation game, to see who could win the most money. Cheifet said the results weren't out yet but the winner would receive a "real" cash prize of $1,000.

Human Edge's Aborted IPO Led Johnson to Shift Focus to Advertising

This was the second *Chronicles* episode to feature a product from Human Edge Software. The first was back in early 1984, when Jim Chapman, a vice president at the company, demonstrated *The Sales Edge*, a desktop PC "expert system" designed to help salespersons. Much like *Mind Over Minors*, *Sales Edge* used responses to a series of yes-or-no questions to generate a customer profile.

Jim Johnson himself was a former salesman for IBM. In an August 1984 story for *PC Magazine*, Connie Winkler said Johnson attended the University of California, Berkeley, in the 1960s as a graduate student in philosophy but was "booted out" for participating in an extended series of protests known as the Free Speech Movement. Johnson and his wife had their first child soon thereafter, so he decided to get a job selling Jell-O.

Fully abandoning his counter-culture roots, Johnson later went to work for one of the great symbols of establishment power–IBM. He later told Winkler that while working for Big Blue he "was involved in a $10 million sale of a 1,000 terminal on-line system for a giant finance company." Johnson said he used the commission earned from that sale to return to graduate school, this time in psychology at the University of Minnesota. At that time, Minnesota received a good deal of grant money “to study whether the computer could evaluate psychiatric patients and lead to better patient care,” Winkler said.

After completing his doctorate in 1972, Johnson went on to work as a professor at the University of Utah, Eastern Virginia Medical School, and the Illinois Institute of Technology. During his time at Eastern Virginia, he started his first company, Psych Systems, Inc., which built upon the work he started at Minnesota and sold computer-automated psychological tests. After taking Psych Systems public and selling his interest, Johnson used those proceeds to start Human Edge Software in 1983.

As I discussed in the previous article, Human Edge initially focused on marketing low-end expert systems to businesses. *The Sales Edge* was part of a series that also included *The Management Edge* and *The Negotiation Edge*. These programs sold for $250 each and could be run on a microcomputer, as opposed to more complex expert software that cost tens of thousands of dollars and required a mainframe or minicomputer. Targeting the business market proved moderately successful, at least initially, and Human Edge said it had sold about 10,000 copies of its various products by mid-1984.

Mind Over Minors was part of Human Edge’s attempt to expand its product line into the home computer market. There was also *Mind Prober*, a $50 program–$30 if you had a Commodore 64–marketed as something of an entry-level expert system that could help individuals generate psychological reports on friends, partners, or even acquaintances. And if that sounds creepy, well, Human Edge openly touted the “Orwellian” nature of the program as a feature, not a bug.

Mind Prober and *Mind Over Minors* both came with accompanying books. Indeed, it seems as if the software was simply a marketing tool to sell the books rather than the reverse. As Bernie Zilbergeld noted in his critique of Human Edge Software, a person could easily buy a self-help book for just a couple of dollars. But adding the software component–essentially a fancy version of a magazine personality quiz–let you charge $50 for the same text.

Critical reviews of *Mind Over Minors* ranged from tepid to mildly positive. A November 1986 article in the *Wilkes-Barre Citizens' Voice* said the program was "incredibly accurate and helpful" in creating a profile for the reviewer's daughter. Yet Dan Gutman, writing for the McNaught Syndicate, found that when he entered information about his two young nephews, the software "missed entirely" with one of them. Gutman was also "disappointed" with the overall lack of insight in the computer-generated reports, noting they offered advice that was no different than most child-rearing books. (Gutman did, however, praise the accompanying *Mind Over Minors* book.) And as was discussed in the episode, Gutman said the "program's accuracy depends entirely on the parent's assessment of his or her own personality and that of the child."

Mind Over Minors was likely the last major product released by Human Edge Software. In July 1985, Human Edge Software filed a registration statement with the SEC, the first step towards making a public stock offering. The statement proposed a $5.2 million offering, selling 833,750 shares at $6.25 each. But before the IPO took place, the SEC's auditors found that Human Edge was–to put it politely–massaging the books.

In a September 1987 statement, the SEC accused Human Edge of failing to "provide adequately for sales returns and/or bad debts and recorded sales in transactions," as well as "misreporting" prepaid expenses. Basically, I think what the SEC said was that Human Edge wasn't properly accounting for returns of its software and overstated its research-and-development costs. In financial terms, the SEC said Human Edge reported a $7,000 profit in 1984 when it should have reported a $111,000 loss.

Human Edge reached a settlement with the SEC. The company admitted no fault but did not challenge the suspension of its registration statement. This effectively canceled the public offering, and Human Edge Software was out of business by the end of 1987.

After Human Edge's demise, Johnson shifted from the psychological software business into marketing. He started Connected Brands, a business-to-business advertising agency, in 1989. Johnson served as that company's CEO until 2001, when the company merged into a Delaware corporation of the same name. (My assumption is that Johnson sold the business.) In 2002, Johnson founded his last business, Home Care Assistance, which provides in-home care for senior citizens living in northern California. Johnson retired in 2015. He passed away in December 2018 at the age of 78.

“Relax” Developer Another Victim in Jack Tramiel’s Battle Against Atari Developers

Synapse Software Corporation was the company behind *Relax*, the subject of Wendy Woods’ questionable demonstration in this episode, as well as *Wizard of Wall Street*, which received its third *Chronicles* mention in this episode. Paul Schindler previously reviewed *Wizard*, and Stewart Cheifet and Gary Kildall demonstrated it during the opening segment of the previous episode on investment software.

Sadly, Synapse itself no longer existed in early 1986 when this episode aired. Its rise and fall can largely be tied to that of another company, Atari, which as I’ve documented in prior posts had its own tumultuous history. To briefly recap, Warner Communications acquired the original Atari, Inc., in 1976. During Warner’s ownership, Atari launched its flagship Atari 2600 video game console as well as a line of 8-bit home computers. When the video game market collapsed in early 1983, however, Warner broke up Atari and sold most of its home computer and video game console assets to former Commodore boss Jack Tramiel, who formed the new Atari Corporation.

Synapse entered this story in 1981. Ihor Wolosenko and Ken Grant co-founded Synapse Software Corporation that year. Appropriate for this episode’s subject, Wolosenko earned his undergraduate degree in psychology, although his first professional endeavor was running a photography studio in Boston. After selling that business and moving to California, Woloshenko told Kay Savetz of *Antic: The Atari 8-Bit Podcast* in 2014 that he’d started hosting hypnosis workshops and needed a way to keep track of his mailing lists. So he and Grant developed *Filemanager 800*, a database program for the Atari 8-bit computer line, which became Synapse Software’s first commercial product.

Synapse quickly expanded its catalog to include other programs, mostly computer games targeting the Atari platform. By April 1983, Synapse had outgrown its original “office” in Woloshenko’s Berkeley apartment and moved into a 22,000 square-foot facility housing 35 employees, according to a contemporary report in *Antic* magazine. In August 1983, Synapse projected sales of around $20 million and had nearly 100 people on the payroll, according to the *Berkeley Gazette*.

While Synapse was soaring, Atari’s collapse was in full swing. In July 1983, Warner ousted Ray Kassar, its own handpicked CEO at Atari, and scrambled to replace him before settling on James Morgan, an outside executive from the tobacco industry. At first, this was actually good news for Synapse. At the 1984 Winter Consumer Electronics Show, the Morgan-led Atari announced plans to purchase a suite of office programs from Synapse: *SynFile+*, the successor to *Filemanager 800*; *SynCalc*, a spreadsheet; and *SynTrend*, a statistics and graphing program. Atari planned to publish and sell each program for $100.

But everything fell apart for Synapse after Warner dumped Atari’s home computer assets onto Jack Tramiel. The new Atari Corporation had no intention of honoring its contractual obligations to purchase Synapse’s software. Wolosenko told Kay Savetz that Sam Tramiel, Jack’s son, literally ripped up the contract in front of him and dared Wolosenko to sue him. Wolosenko did just that, and he told Savetz that the Tramiels eventually paid up just before a civil trial was scheduled to begin.

But by that point, the damage was already done. Faced with Atari Corporation’s refusal to pay for the approximately $1.5 million in software it had ordered under Morgan, Synapse needed money just to stay afloat. In late 1984, Brøderbund acquired a majority interest in Synapse. Although Synapse remained a separate entity for a few more months, by January 1985 it had been fully absorbed into Brøderbund. Synapse continued as a separate division for about another year to develop new products. But it was Brøderbund that published and marketed *Relax*, *Wizard of Wall Street*, and the various *Syn* programs originally sold to Atari.

Dr. Bernie Zilbergeld (1939 - 2002)

Dr. Bernie Zilbergeld died in June 2002 due to complications from diabetes, according to an obituary in the *New York Times*. Although his own work wasn't discussed in detail during his *Chronicles* appearance, Zilbergeld was an expert in the psychology of male sexuality. He also gained prominence as a critic of the value of long-term therapy.

Zilbergeld earned his doctorate in clinical psychology from Berkeley in 1971. He then spent several years as co-director of clinical training for the Human Sexuality Program at the University of California at San Francisco. Zilbergeld's work at San Francisco led to the publication of his 1978 book, [*Male Sexuality: A Guide to Sexual Fulfillment*]https://archive.org/details/malesexualitygui0000zilb).

Zilbergeld told the *Fort Worth Star-Telegram* in a March 1978 interview that his book was designed to confront many of the "myths" and cultural taboos surrounding male sexuality:

> There is tremendous talk among men about sex, but it is not talk that conveys information. It's more the kind of sexual talk that shows that we belong to the same club, the locker room talk, but as far as talking about how we got introduced to sex or about any problems, men don't do that.
>
> Men assume there are certain standards they have to live up to, and right away they compare things to the only model they know (themselves). They don't realize that other men have the same reactions and feelings. In sex, you learn a lot of stuff early that is of no use.

The *Times* obituary noted that Zilbergeld was among the first authors to publish a popular book on this subject. *Male Sexuality* went on to sell over one million copies and was still in print at the time of Zilbergeld's death.

Zilbergeld wrote another book in 1983, *The Shrinking of America: The Myths of Psychological Change*, which addressed pop psychology and psychotherapy. In a September 1983 interview with Cheryl Lavin for the *Palm Beach Daily News*, Zilbergeld explained that therapy was only realistic for attaining "small goals," i.e., to make a "modest change in a specific area" of the patient's life. For instance, he did not consider therapy useful for "full-blown psychoses" that required medication, or even issues related to something like alcohol addiction, where a person would likely be better served attending an AA meeting.

Notes from the Random Access File

- This episode is available at the Internet Archive and has an original broadcast date of February 11, 1986.
- The Karen Lambert Research and Development Foundation, which Wendy Woods profiled in her first report, was named after a teenager who spent 81 days in a coma following a 1982 car accident, according to the *Los Angeles Times*. Lambert's father, a computer scientist, developed software to help his daughter with her cognitive recovery after she came out of the coma. He later sold his software commercially and used the proceeds to establish the foundation.
- On a less heartwarming note, the program demonstrated by Stewart Cheifet and Gary Kildall during the introduction, *IntraCourse*, was developed by a Miami businessman, Leigh Rothschild, who decided the best way to break into the software market was by selling sex. Rothschild did tout his product as an expert system, claiming he'd hired a team of psychologists to develop the program. Celebrity psychologist Dr. Joyce Brothers also endorsed *IntraCourse* as a paid spokesperson. I don't know how well *IntraCourse* sold, but the software company that Rothschild started, IntraCorp, went on to have a decade-long run as a publisher of computer games, mostly licensed titles such as *Terminator 2: Judgment Day - Chess Wars*.
- Although the Biofeedback Institute of San Francisco still maintains an active website, California records indicate the company dissolved in 2001.
- Dr. George Gould continued to develop and market his *Therapeutic Learning Program* into the 2000s, transitioning to a web-based interface in the 1990s. Gould's Interactive Health Systems remained an active corporation on the California books until 2015.
- Human Edge Software was sometimes mistaken for another company, Human Engineered Software, which also operated in the mid-1980s. *PC Magazine* ran a short news item on the confusion, reporting that

Jim Johnson was once asked on a television program–not *Chronicles*–about "his company's supposed bankruptcy." The host was actually referring to Human Engineered Software, not Johnson's Human Edge Software.

- In case you were wondering, Stanford won the battle of the MBAs against Harvard and Penn. According to the *St. Louis Post Dispatch*, Stanford's team ended the *Wizard of Wall Street* competition with $21.5 million in computer money, which reportedly "astonished" the game's creator. (Penn finished with $9 million, while Harvard posted a net loss.)

Chapter 18: TellStar, Halley, and the Lick Observatory

In 1705, Oxford geometry professor Edmond Halley published a paper, *A Synopsis of the Astronomy of Comets*, which proposed that comets observed from Earth in 1531, 1607, and 1682 were in fact the same comet. Based on his calculations, Halley proposed the comet would be visible from Earth roughly every 75 years, with the next appearance expected in 1758. He never lived to see it, having died in 1741, but this prediction proved correct. Now known as Halley's Comet (or Comet Halley), the celestial object's most recent Earth appearance occurred in February 1986.

This next *Computer Chronicles* episode, which aired that same month, focused on astronomy software. There was something of Halley's Comet-fueled "boom" in this niche of the software market, with roughly two dozen programs available to consumers. Given that astronomy largely involves performing intricate calculations, as demonstrated by Halley's original paper, even the modest home computers of this era were capable of aiding amateur astronomers in their efforts to learn more about the galaxy.

Stewart Cheifet and Gary Kildall opened the program by demonstrating one of the many Comet Halley-themed programs available, this one actually titled *Comet Halley* for the Macintosh by Great Wave Software. Cheifet explained the software helped locate the titular comet in the sky. The program could also run in "auto mode" and show the comet's movement from day-to-day.

Cheifet said there seemed to be a high correlation between amateur astronomers and computer hobbyists. He asked Kildall if he was ever into astronomy. Kildall noted that he previously taught marine navigation at the Naval Postgraduate School before starting Digital Research. In that role he regularly used tables, logarithms, and "a lot of addition and subtraction" to chart locations by examining the locations of stars. He said today you just needed to use a little navigation calculator–or if you were really lazy, you could just push a button on a satellite receiver.

Lick Observatory Astronomers “Swamped” by Computer-Generated Data

Wendy Woods presented a remote report from the Lick Observatory near San Jose, California. Woods said the observatory dated back to the late 19th century, when its “beautiful mountaintop domes” were constructed in the wilderness with the help of wagon teams and the simplest of machinery.

While the domes still housed some of the original equipment, Woods said, the operation of the observatory’s telescopes had changed dramatically. Lick’s C. Donald Shane reflector telescope was operated by–and fed data to–a computer. Its movements were orchestrated by a program that determined where to aim the telescope and compensated for the Earth’s movement. The telescope’s 10-foot-wide mirror was the source of its impressive light-gathering power, but its final output had changed. Instead of an eyepiece and a photographic plate, charged couple device (CCD) cameras could detect levels of brightness with unmatched sensitivity.

Burt Jones, the observatory’s associate director, told Woods that he’d recently been taking CCD images that contained roughly 2 million bits of information per image. Over the course of an evening, the computer would take 20 to 30 such images.

Woods noted that computers had given astronomers greater control to sift through the dense matrix of light points and analyze objects selectively. For example, overlays of false color could help Halley’s Comet appear more prominently. The astronomer positioned the telescope remotely by matching a position on the CCD array to absolute coordinates in the sky. The CCD could then record bright and faint objects in the same image thanks to its quick exposure time. Finally, astronomers could more easily isolate an object by separating it from the surrounding light emissions and reflections.

In fact, Woods said, to some researchers the density of information available today taxed our ability to absorb it. Jones said that as an observational astronomer, he found that data gathering was now more efficient by a factor of 10 or even 100 versus when he entered the field 20 years ago. Indeed, he said astronomers today were “swamped” with data because of computers.

“Novice” Astronomers Benefit from PC Software

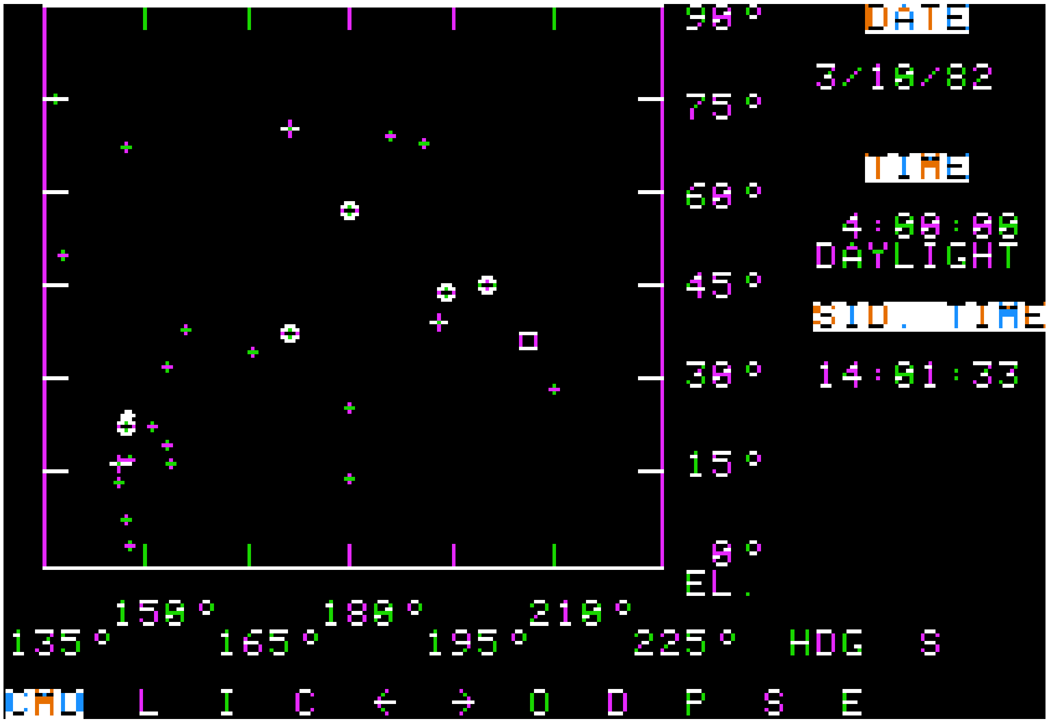
Robin Raskin and Evan Scharf joined Cheifet and Kildall for the first studio round table. Raskin was a contributing editor with *Family Computing Magazine*, where she'd recently authored a feature story comparing astronomy software available for home computers. Scharf was a Colorado-based amateur astronomer and professional software developer who created the astronomy program *TellStar*.

Kildall noted that personal computers seemed like a "natural fit" for astronomy. He asked Raskin about the available astronomy software on the market. Raskin said the market in this area was "very exciting." She noted she actually started her survey two years earlier, in 1984, but at the time there was nothing available for the "novice." Now, thanks to interactive graphics, a home computer could provide a graphical view of a constellation or planet on the screen. The novice could then take that information and use it to locate the same objects in the real world (with a little more knowledge).

Kildall asked if "novices" meant students or just amateur astronomers. She said students could definitely use this software. Amateur astronomers could go further and look at some of the coordinate information and do less of the mathematical interpolation. But she said families that had been using computers for household chores could now sit down for the first time–especially with Halley's Comet approaching–and have a way to learn about astronomy.

Kildall turned to Scharf and asked him to demonstrate *TellStar*. Scharf said his program was for someone who knew nothing about astronomy and would like to look up in the sky and identify what was there. The user could input a location into *TellStar*, as well as any time and date between the years 1 and 3000. For this example, Scarf used San Francisco on March 10, 1982, at 4 a.m. (There was a *syzygy*–an alignment of the planets in the Solar system–on that date that some people believed heralded the end of the world.) Scharf said that in reality, that day simply allowed people to view six planets at the same time, lined up in a view only 90 degrees wide.

Scharf said that once *TellStar* had the basic information it would then perform the necessary calculations–accounting for things such as the Earth's procession or "wobble", inner and outer planet relationships, etc.–and present a graphical view from San Francisco looking due south at 90 degrees. Scharf added that *TellStar* could produce nine different views for each location: one for each of the eight points of the compass and a ninth, overhead view. He noted the final graph showed not only the six planets, but also bright and dim stars as well as constellations. (Below is a recreation of the graph that Scharf produced, which I created by running *TellStar* in an emulator.)



A square graph plotting the location of planets and stars as they appeared over San Francisco at 4 a.m. on March 10, 1982.

Cheifet asked if *TellStar* could actually help people identify specific constellations. Scharf said if the user pressed "C" on the graph screen, the software drew lines between the stars that made up any visible constellations. You could also press "I" to bring up a crosshair to select a specific object on the screen. A selection then brought up a separate information screen with that object's celestial location, compass heading, and the times that it rises and sets.

Cheifet wanted to know how you could find a particular object ahead of time. Scharf reiterated you could enter any future date and time. The program could produce graphs for any location up to the year 3000. On the graph screen the user could press "L" and enter the name of an object, such as Saturn. This again produced a separate information screen. When the user returned to the graph, there would be a flashing cross-hair indicating the requested object's location.

Kildall asked how many different objected were cataloged in *TellStar*. Scharf said there were three different star tables, and each one had about 250 objects, which represented the brightest objects you could see in the night sky. Cheifet asked about Halley's Comet. Scharf said *TellStar* could locate the comet when it was close enough to Earth. He said he'd used the software himself to assist with his own viewings.

Cheifet turned back to Raskin and asked her what the software approach to astronomy did that you couldn't get out of a book or the usual tables and numbers. Raskin said that software like Scharf's gave people an "interactive planetarium," which was handy if they didn't live near a real planetarium, or they were in an area where the ambient light made it difficult to see objects in the sky. Additionally, books were static, while the stars were dynamic, and programs like *TellStar* moved along with them.

Raskin added that there was other software available that complemented *TellStar*, such as *Journey to the Stars*, which provided a tutorial on the concept of *apparent motion*, i.e., where you stood on the Earth and understood why the stars seemed to be moving. There were also bulletin board systems available for people who were interested in astronomy and had a modem.

Kildall asked if astronomy software was being used extensively in schools. Raskin said there are some software packages, such as one called *Astronomy*, that were starting to filter into the schools. *Astronomy* contained 10 different simulations that let students do things like witness the birth of a planet.

Cheifet asked Scharf how he translated the three dimensions of the sky into the two dimensions of a computer screen. Scharf said it was a bit of a challenge. Things that were close to the horizon up to about 45 degrees elevation looked normal. But when one was at higher elevations there were distortions. That's why *TellStar* provided an overhead view to compensate for this distortion.

NASA Models Whole Universes

Wendy Woods returned for her second remote report, this time from NASA's Ames Research Center in Mountain View, California. Woods said that until recently, scientists were confined to observing the stars as a series of snapshots through telescopes. Today, scientists saw space as a dynamic, moving universe, condensing time through computer modeling.

At the Ames Center, Woods explained, astrophysicists were exploring the "unseen," employing data gathered from infrared satellites and space probes. The data was entered into sophisticated graphics workstations and then manipulated through a DEC VAX 11/785 minicomputer and NASA's Cray supercomputer. The result was imagery of “universes colliding,” experiments solidly grounded in physics.

Dr. Bruce Smith of NASA told Woods that out of these experiments, scientists could extract certain characteristic properties they would then expect. This information was then given to the observational astronomers, who were told, “This is what we would expect in the formation of a galaxy.” He added the shapes of elliptical galaxies, in particular, were much more complicated than thought in the past.

Woods said the modeling experiments to date had proven that “halos” of matter, invisible through telescopes, exist throughout galaxies. Coming experiments would attempt to explain star formation and how planets were created. Smith told Woods that this interplay between observation and theory helped to make progress.

How Computers “Revolutionized” Astronomy

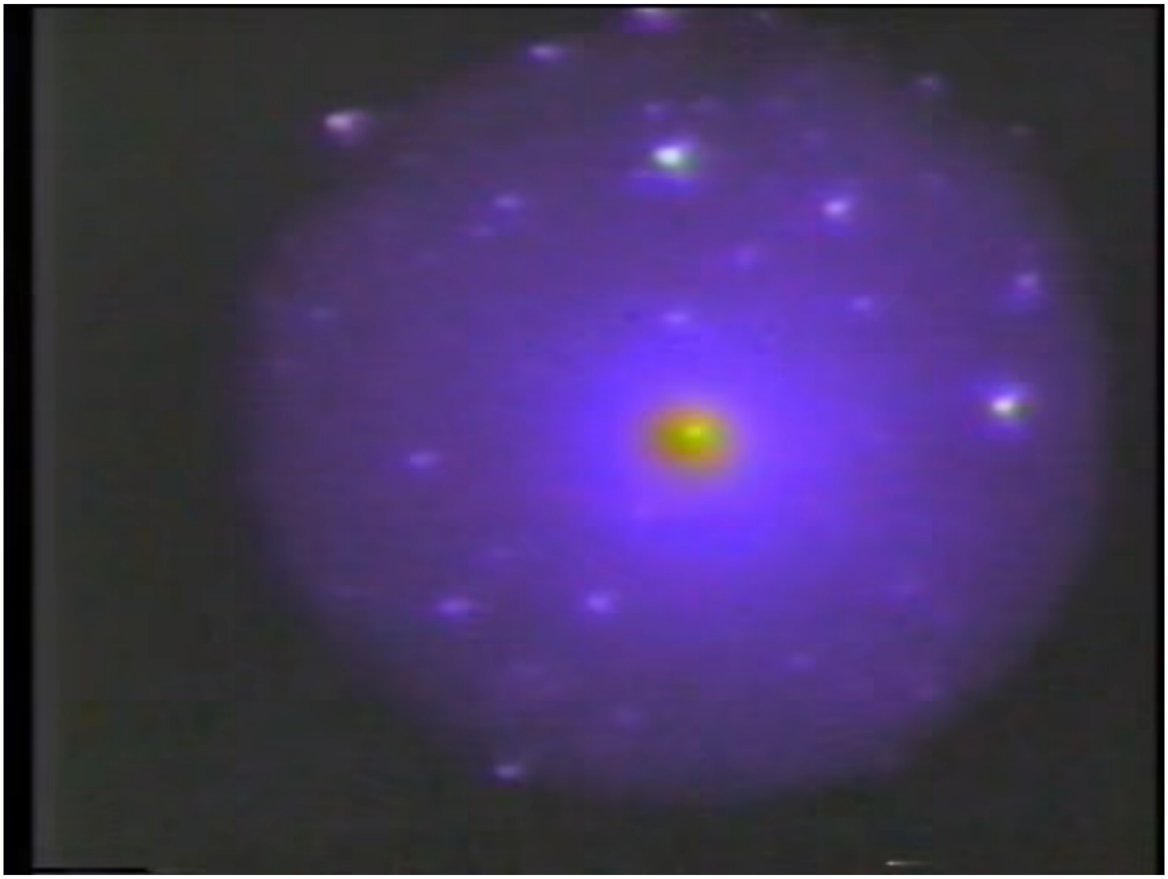
For the final segment, Dr. Bob Petersen and Dr. Steve Vogt joined Cheifet and Kildall in the studio. Peterson was an astronomy professor at the College of Marin and the founder of Starsoft. Vogt was an associate astronomer at the Lick Observatory.

Kildall asked Vogt if computers had really changed the popular image of an astronomer sitting by themselves looking through a telescope. Vogt said absolutely. The field of astronomy had been “totally revolutionized” by computers. Vogt said astronomers such as himself rarely looked through telescopes anymore. Personal computers were now used to control and point the telescope. Computers were also used to control the electronic instrumentation that did the actual observing, much like big television cameras. And larger computers were used to reduce and analyze data by creating simulations and models.

Kildall asked Vogt what kind of information he actually collected in his work. Vogt said they basically collected photons. He was an optical astronomer, so he collected light. He observed photons, counted them, and sorted them into their colors or polarizations.

Cheifet turned to Petersen and asked about Starsoft’s software called *Halley*. Petersen explained *Halley* was actually four small programs put together. It provided an animated sequence of Halley’s Comet. He demonstrated one part of the program, which allowed the user to input a range of dates–in this case 300 days from October 1, 1985–and see an animation of the comet's movements from the vantage point of the Sun. He then showed a second demo, this time showing the comet's path over a period of 95,000 days from January 1, 1945. (Petersen said 95,000 days matched the approximate length of Pluto's orbit around the sun, so it provided a useful comparison with Halley's Comet.) Petersen said *Halley* could also produce an Earth-based view of the comet's path, and he demonstrated that as well.

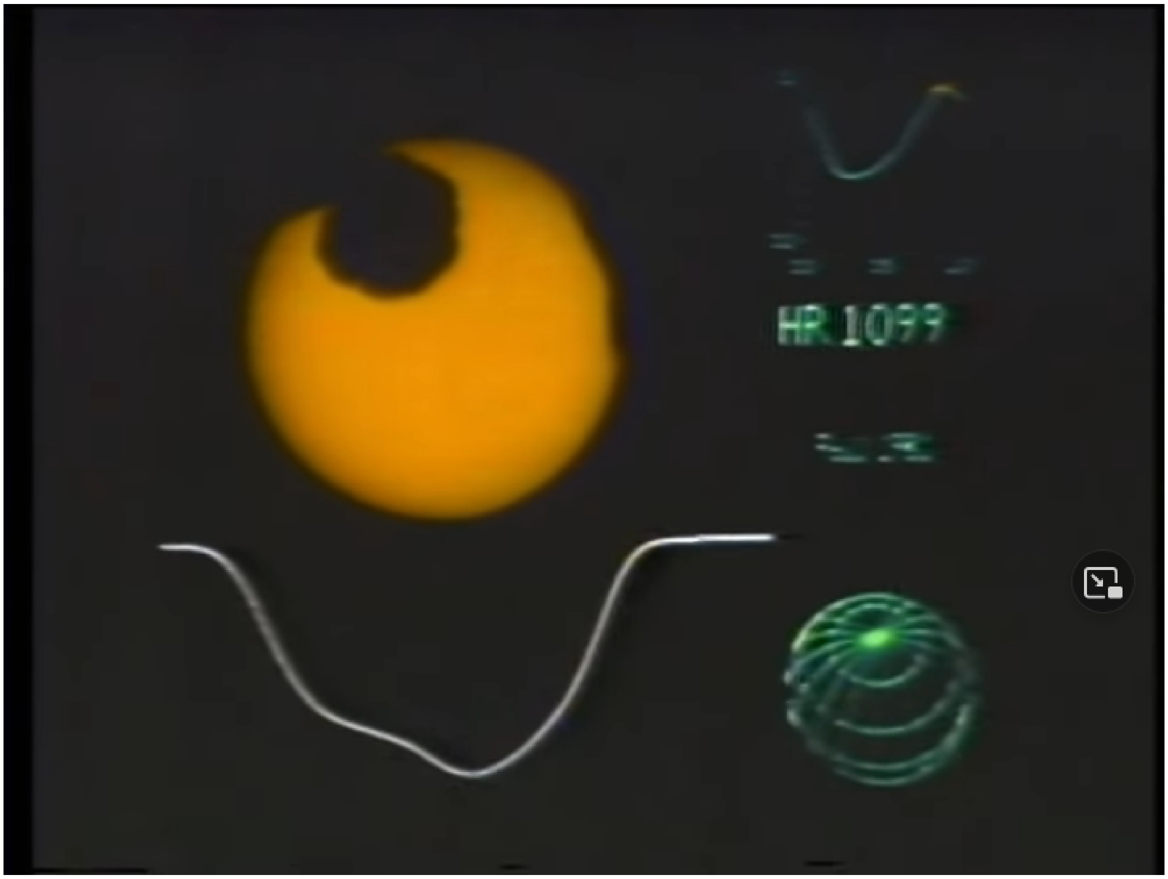
Cheifet noted that while *Halley* produced approximations of the comet's path, Vogt and his team at the Lick Observatory had actually taken pictures using their computers. Vogt described some footage from those pictures (see below). He said this represented a computerized image-intensified version of one night's worth of data on Halley's Comet. The data was obtained by astronomers Richard Stover and Burt Jones using a 40-inch telescope. Each frame was taken by a CCD, processed, and assembled by the computer into a color-enhanced image (see below). The colors were not real; they were simply representations of intensity, which helped the astronomers see detail and structure more quickly.



A Doppler image of Halley's Comet. The image is of a large blue-colored sphere with a smaller sphere, reddish-orange in color, at the center.

Cheifet clarified this was not an optical, filmed picture. It was really a television picture of the comet. Vogt said it was a "super-television picture with a super-sensitive television camera."

Vogt also showed some footage of a Doppler image of HR 1099, a binary star system about 116 light years from Earth (see below). You couldn't see it as a physically differentiated star system from Earth. But using a variety of computerized techniques, it was possible to make Doppler images of the star and see dark "star spots." The graph on the bottom was a spectral-line profile at a wavelength near the resonance absorption of a single atom.



A Doppler image of a binary star. At the top left is a bright orange sphere with a smaller black sphere inside at the top left. There is also a wavelength form at the bottom.

Cheifet asked Vogt about the use of computers to search for radio waves and possible life in outer space. Vogt said one of the biggest efforts underway was the SETI program, which used very sophisticated hardware and software to scan the radio-frequency spectrum for signs of intelligent life. SETI's high-speed computer systems could scan millions of channels at once.

Cheifet asked what kinds of astronomy tasks required something like a Cray supercomputer as opposed to a PC. Vogt said problems like the previously demonstrated Doppler imaging. That required a DEC VAX 11/780, which was reasonably well-suited to the task. Crays were generally used for simulations, like making a model of the inside of a star or the explosion of a supernova, which required billions of calculations.

Cheifet asked Petersen if he saw growing interest in computers among astronomy students. Petersen said yes, particularly due to the recent interest in Halley's Comet from the media and the general public. He'd noticed "quite a bit of activity" around astronomy at his college as a result.

Osborne Called It Quits; Jobs Bought Expensive Computer from Lucas

Stewart Cheifet presented this week's "Random Access," which he recorded in February 1986.

- Computer retailer ComputerLand planned to introduce its own computer. The company was looking for a manufacturing partner in Asia to produce a ComputerLand-branded MS-DOS machine to compete with the Tandy 1000 and the Leading Edge Model D. Cheifet said the new ComputerLand machine could be on store shelves by June 1986.
- Osborne Computers declared bankruptcy for a second time. This time, the company would not try to reorganize. Instead, its assets would be liquidated. Osborne's creditors declared the company in default after it failed to make payments on its $6 million in debts.
- Commodore posted a $53 million loss for the last quarter despite record sales of over $300 million. Cheifet noted that Commodore stock had been taking a beating but some analysts said the company would eventually be profitable.
- Steve Jobs bought Pixar, a company that made a high-end graphic computer, from filmmaker George Lucas. Cheifet said Pixar computers were designed

to do 3D graphics for movies but had found a better market in the medical and military fields.

- IBM was the “new kid on the block” at a recent UNIX show in Anaheim, California, showing off the UNIX-based IBM RT PC. Cheifet said other UNIX vendors seemed to be moving towards IBM, with much talk of the need to “integrate” UNIX into the MS-DOS world.
- Paul Schindler reviewed *411* (Select Information Systems, $149), a program that indexed the text in every file on a computer’s hard disk. Schindler said *411* managed to produce an index that only took up 1-2 MB of disk space. There was also a built-in utility to index new files as they were created.
- New industry figures showed that just 10 companies accounted for 70 percent of the computer software business: Lotus, Microsoft, IBM, Ashton-Tate, Tandy, Apple, Digital Research, MicroPro, Multimate, and Software Publishing Corporation. Cheifet added that the top-20 selling programs accounted for 80 percent of the software business.
- President Ronald Reagan submitted a new budget to Congress, which included a “surprisingly high amount of money” for basic technology research, representing an increase of about 8 percent.
- Northwest Airlines purchased a $40,000 software package that told the company’s Sperry computer how many discount seats it should sell on a flight. The program analyzed 30 criteria, such as load factor and competition, and then set the number of cheap seats. Northwest officials claimed the upgrade of one discount seat a day per flight could generate an extra $12 million in revenue.
- Workers at the Federal Reserve Bank in San Francisco recently spent three days learning how to use their new computer system by working with a dummy program containing fake transactions. But when the system went live on Monday, the dummy program was still running, so the computer transferred $2 billion of funds to 19 banks that never requested the money. Cheifet said the error was discovered within a few hours, but two of the banks waited 24 hours before notifying the Fed of the mistake.

Evan Scharf (1943 - 1991)

Evan Scharf died on September 11, 1991, at the age of 48. Police found Scharf and his 10-year-old son, Robbie, stabbed to death in their Louisville, Colorado home. The police quickly identified a suspect in the double murder, who was a former neighbor of the Scharfs. The *Rocky Mountain News* reported the suspect was released from jail the previous night after posting bail on pending burglary charges. Police then found the suspect driving Scharf's car a few hours later, which led to a check of the Scharfs' home.

In 1992, the suspect–who am I choosing not to name here–was tried and convicted of both murders. The Boulder County district attorney elected not to seek the death penalty. A judge therefore sentenced the defendant to two consecutive life sentences. As of this writing, he is still in prison.

Scharf's sister told the *Rocky Mountain News* that he'd "started a home-based computer software business several years ago to spend more time with Robbie." (Scharf was apparently a single parent, although he was engaged at the time of his death.) During the 1970s, Scharf was the marketing manager for General Automation, a minicomputer manufacturer based in Anaheim, California. In 1981, he left General Automation to join Information Unlimited Software (IUS) in Berkeley as its vice president of marketing. IUS was perhaps best known for publishing *EasyWriter*, a word processing program for the IBM PC written by another former *Chronicles* guest, John Draper.

IUS also published the first version of Scharf's *TellStar* in 1981. After Computer Associates acquired IUS in 1983, Scharf moved to Boulder County, Colorado, and self-published *TellStar* under his Scharf Software Systems for a short time. In 1985, another Boulder-based software company, Spectrum HoloByte, acquired the publication rights.

As Scharf alluded to in the episode, *TellStar* came in two versions. "Level 1" only included star tables for the northern hemisphere and originally retailed for $40. "Level 2" added the southern hemisphere and a list of roughly 100 additional astronomical objects and initially cost $80.

Rich Miser Opted to Fund Observatory Instead of (Literal) Pyramid Scheme

The Lick Observatory is named for James Lick. Born in Pennsylvania in 1796, Lick first gained notoriety as an organ and piano maker in New York City during the 1820s. After expanding his business into South America, Lick moved to California in 1848, where he lived the life of a miserly rich man until his death in 1876.

According to a history published by the Lick Observatory, it was George Davidson, an astronomer and president of the California Academy of Sciences, who approached Lick with the idea of donating some of his fortune to build a telescope. (Lick originally pondered building a giant pyramid in San Francisco as a monument to himself.) Two years before he died, Lick set aside $700,000 in a trust to fund the construction of an observatory.

An 1888 report in England's *Liverpool Mercury* detailed the observatory's lengthy construction process:

> To find a site for such a building was no easy matter, for astronomers are not agreed as to what conditions are most favorable to stellar observation, but it was settled that Mount Hamilton, near San Jose, would be the best place for it. Mount Hamilton is 50 miles from San Francisco, and 15 miles, as the crow flies, from San Jose, which is the nearest railway station. The summit of this mount is 4,203 feet above sea level, and with one exception is the highest peak within a radius of 100 miles.
>
> The authorities of Santa Clara county constructed a road from San Jose at a cost of $75,000, and all the steep gradients have been avoided by making this road 26 miles long. The mountain itself is a tough, feldspathic sandstone, and before the observatory could be erected they had to clear away about 72,000 tons of this rock.

The "real work" didn't begin on the construction until 1870, the *Mercury* noted. And it was not officially completed until June 1888, when the observatory was transferred to the University of California, Berkeley, during the school's commencement ceremony. (The observatory has been affiliated with the University of California, Santa Cruz, since the 1960s.) Professor Edward S. Holden, the Lick Observatory's first director, wrote to the *San Francisco Examiner* in September 1888 that it took a month just to test the new telescope's photographic lens:

> Practically, we found ourselves confined to exposures of one second and less, and, therefore, to the moon as a subject.
>
> Some sixty-five exquisite negatives were taken on twenty nights. Many, indeed most of them, are better than any previous pictures which I have seen.

At the time, the Lick Observatory's 36-inch refractor telescope was reportedly the largest of its kind in the world. In 1959, the observatory commissioned a new, 120-inch reflector telescope, which was completed in 1959 and named after the observatory’s director at the time, C. Donald Shane. This was the telescope used to generate the images discussed in this *Chronicles* episode–and in fact, the Shane telescope still remains in use today.

Notes from the Random Access File

- This episode is available at the Internet Archive and has an original broadcast date of February 13, 1986.
- For the record, Robin Raskin’s *Family Computing* article found 23 different astronomy programs on the market in early 1986, including *TellStar* and *Halley*.
- Robin Raskin wrote for a number of publications during the 1980s and 1990s, including *Family Computing*, *InfoWorld*, and *USA Today*. She also served as editor in chief of Disney Publishing’s *FamilyPC* from 1993 to 2000. During the 2000s, she shifted into blogging and consulting. In 2010, Raskin founded Living in Digital Times (LIDT), a group that organized a number of conferences targeting “technophiles.” After selling LIDT to the Consumer Technology Association, Raskin started the Virtual Events Group in 2021.
- Burt Jones retired from the Lick Observatory in 2011. He first joined the observatory in 1970 and served as its associate director from 1996 until his retirement.
- Dr. Steven Vogt remains affiliated with the Lick Observatory and the University of California, Santa Cruz. In 2010, Vogt led a team that identified a potentially habitable planet outside of our solar system. The existence of the planet, called Gliese 581g, remains the subject of debate within the scientific community. According to a 2016 Space.com article by Elizabeth Howell, a rival team of astronomers based in Geneva, Switzerland, published a paper disputing the findings of the Vogt team, which “kicked off a flurry of publishing activity about 581g, sometimes also discussing the plausibility of other supposed planets in the system.”
- George Lucas’ sale of Pixar to Steve Jobs would make a big splash a decade later when the company released the first computer-animated film, *Toy Story*. But in 1986, Jobs viewed Pixar as a hardware company. The Pixar Image Computer initially sold for $122,000–or roughly the cost of 12 Apple Lisas.

Chapter 19: Heald College and DECworld ’86

Alexander “Sandy” Astin was a longtime professor at the University of California, Los Angeles, best known for creating an annual survey of college freshmen. Astin, who passed away this past May at the age of 89, first developed “The American Freshman” survey at the American Council for Education in 1969. He continued the project after joining the UCLA faculty.

Gary Kildall referenced Astin’s 1985 survey in a March 1986 *Computer Chronicles* episode on “Careers in Computing.” Notably, Astin’s survey of the previous fall’s freshman class found that only 4.4 percent of respondents “aspired to careers as computer programmers or computer analysts, down from 8.8 percent in 1983,” according to the *Los Angeles Times*. Astin suggested the decrease may have actually been the result of *greater* exposure to computers by the 1985 freshmen, as they realized computers could be useful in fields other than tech. He further speculated that students “may be misinterpreting the recent, well publicized troubles in the computer industry.”

In any case, this episode largely focused on the process of seeking jobs in the computer field more than the overall state of the industry. Keep in mind, this was only a few years into the era of the personal computer, and traditionally access to machines was limited to people attending or working for institutions of higher learning. So the emphasis here was on college graduates seeking work.

Stability or Fun?

Stewart Cheifet and Gary Kildall opened the show by looking at an online career network accessible through a Macintosh. Cheifet said these “electronic help wanted ads” offered jobs in fields such as fiber optics, semiconductors, personal computers, computer-aided design, robotics, and new computer architecture.

But Cheifet added that many potential job-seekers were confused. After all, one day you read in the newspaper that a computer company laid off 500 people, and the next day you read there were all kinds of job opportunities in the computer field. So which was it? Kildall said the computer industry was still young and “quite volatile.” Someone seeking stability would move towards the mainframe market, where a bright engineer with a well-rounded education in mathematics or computer science would always find long-term employment. Career planning in newer, emerging areas was more difficult. But if you were adventurous, you’d find it was a “lot more fun.”

Self-Employed Consultants Filled Short-Term Needs

Wendy Woods presented her first report. She profiled Jack Porterfield, a self-employed consultant in the computer field. Woods said that between the “stodgy giants” and the “fragile startups” of the computer industry, there were a group of people, like Porterfield, who performed the important role of independent consultants–primarily programmers and designers that sold their expertise.

Woods said Porterfield decided to leave the security of the corporation in exchange for his independence. He told Woods that he’d decided to work on his own because the company he had been working for had grown too large for his comfort. Several of his friends were working as self-employed consultants and they helped convince him to “take the plunge as well.”

Woods noted that Porterfield’s “office” was now in his living room, which housed some “very sophisticated” computer equipment. Porterfield had been keeping busy since choosing self-employment, she added, but he warned that consulting was not for “timid souls.” He told her that the ability to take on a job, do it well, and make a client happy were really what it came down to. In this business, if you had to show a resume, you didn’t get the job. Rather, you had to convince somebody on a one-to-one level that you could do the work–and then back that up by getting a product running.

Woods said the demand for independent consultants demonstrated how a computer company operated, and why it needed to go outside for the solutions to its problems. Porterfield said the two main reasons were technical competence and support. With respect to technical competence, the company may not be able to hire someone or it may not have anybody to fill the necessary role. As for support, the company may just need a particular job done once. And while it may appear on the surface that it was expensive to hire a consultant like him, the company may only need him for 2 or 3 weeks to get something up and running, and then it never has to deal with that particular problem again.

What Were Companies Looking for in College Graduates?

James Patterson and John Podkomorski joined Cheifet and Kildall in the studio. Patterson–not the author–worked in the career placement office at Stanford University. Podkomorski was a research-and-development section manager at Hewlett-Packard (H-P) and also worked with the company’s college recruiting.

Kildall asked Patterson about Sandy Astin’s recent study and its finding that fewer college freshmen were interested in pursuing a computer science degree than in past years. What did he think was the reason for that? Patterson said he wasn’t sure, but he thought what happened was that even liberal arts students found they could also obtain employment in the hi-tech market just by taking a few courses in computer science. One did not necessarily need a degree in computer science or electrical engineering to find employment in the hi-tech industry.

So computer science training had been dissipated among other disciplines, Kildall suggested. Patterson said yes. For example, you could find a music major getting a job as an assistant programmer so long as they took the courses necessary to perform that particular work. Kildall asked Podkomorski if that was his observation as well. Podkomorski said he saw some of that. There was also a “renaissance” of people getting into the computer field by getting business degrees. That said, he continued to see a “very high” emphasis in the more technical computer science and engineering fields.

Kildall asked Podkomorski what he actually looked for when he went to a college looking to recruit potential new hires. Podkomorski said H-P had several different types of requirements. In his department, which was research and development, they were obviously looking for well-qualified students with a “very high GPA” who had strong technical backgrounds and a demonstrated ability to work in the field. They also recruited for traditional computer jobs–programmers, technicians, et al.–that all had slightly different criteria.

Looking at the other side, Kildall asked Patterson how he prepared a student to talk to a recruiter like Podkomorski. Patterson said they wanted the student to talk about their background and give a potential employer an overview of the types of courses they’d completed to meet the employer’s particular need. He also counseled students on resume writing and general job-hunting skills. In particular, he emphasized communications skills, noting that engineers no longer worked in isolation but were expected to function as part of a group.

Cheifet asked Podkomorski how competitive the market was for new college graduates. Cheifet quipped that a company like H-P probably had its choice of 50 people with a 4.0 GPA for every open position. Podkomorski said the competition was “very, very tough,” particularly if you were coming out of a degree program and looking to work for a major corporation. He said that on the campus where he did his recruiting, there were about 150 to 200 computer science graduates each year, and H-P typically hired only 15 to 20 of them. And that represented the top 20 percent of the class that all the other major computer companies wanted to hire. Ultimately, there were enough jobs for everyone, but if you wanted a job at one of the major companies the competition was intense.

Kildall asked Podkomorski about the schools his company specifically targeted and what were the characteristics of the graduates they sought. Podkomorski said he recruited at the University of Wisconsin-Madison. Altogether, there were about 20 schools that H-P targeted, including the

University of Illinois Urbana-Champaign, Stanford, Berkeley, and MIT–all schools with good scientific and technical programs.

Cheifet said that if you had intense competition from students who all had 4.0 GPAs, what was that extra thing a recruiter like Podkomorski looked for to make a final hiring decision. Echoing Patterson’s earlier point, Podkomorski said it was communication skills and experience. He also looked at faculty recommendations and the student’s ability to demonstrate “practical skills.” He cared more about that than if they got As on their exams. Kildall commented that as an employer himself, he often looked to see if a student had completed a “good-sized project” from start-to-finish.

Cheifet asked Pattreson what areas of employment were students actually looking to get into right now. Patterson said the trend, particularly among electrical engineering students, was to get into product marketing and customer support rather than focusing entirely on design. He noted one benefit that students had in Stanford’s area was that they didn’t have to just apply for work in the semiconductor industry. There were also companies focused on “emerging fields” such as telecommunications, robotics, and biomedical engineering. But the critical thing was that engineering students realized they no longer wanted to focus exclusively on design–they wanted to work with people while still working with their technical expertise.

Podkomorski said that in an academic environment, students were often told that they must go into research-and-development because it represented the “state of the art,” yet the student’s personality wasn’t suited to that type of work, so they ended up failing. It was therefore important for students to focus on finding the right job for their personality. Kildall said technical people–presumably including himself–now understood they needed to have marketing people around to support their work. Podkomorski added that the number of people working in developing new products was also much smaller compared to those tasked with sustaining existing products.

Training Students for the Future Jobs of 1995

The next segment was just Cheifet and Kildall looking at, and discussing, online job listings for several minutes. This wasn’t interesting enough to recap, so let’s move on to Wendy Woods’ second report, a remote segment from Heald College in San Francisco. Woods said that 9 out of 10 students would graduate from Heald, a two-year technical school, and walk into well-paying jobs in the computer industry. Heald trained students in the fields of hardware systems analysis, software programming, and computer maintenance.

Woods said that according to the U.S. Department of Labor, these computer fields were expected to be among the fastest-growing occupations in the country through 1995–among the best for any profession. Despite the computer industry’s slump in 1985, the careers that Heald’s students were training for had “tremendous potential.” While fewer would enter the manufacturing end of the business, at least compared to several years ago, more would get design and engineering jobs, especially in fields such as microwaves and telecommunications, as America’s electronics industry matured and specialized.

Timothy Knapp, Heald College’s vice president of admissions, told Woods that his students would have “wonderful opportunities” in electronics and computer technology. He said that included not only design and manufacturing but also quality control, installation, and servicing of electronic products.

Woods said that while students realized that increasing enrollment in computer studies also meant increasing competition, they were still optimistic. One student, Bob Sutton, told Woods that while the computer market was down 3 or 4 months ago, it was picking up today. Woods noted that enrollment in technical schools was generally increasing by about 15 percent a year–while the number of available jobs outpaced that figure. Woods added that by 1995, many people who graduated from technical schools today would be employed in specialties that we could only dream about today.

Telecommunications a “Hot Area” for Job Growth

Pat Hill Hubbard and Harry Hamlin joined Cheifet and Kildall for the final segment. Hubbard was the vice president for engineering and technical education with the American Electronics Association (AEA). Hamlin–not the actor–ran a hi-tech recruiting firm.

Kildall asked Hubbard what was the “hot new area” to enter in the computer field. Hubbard replied it was telecommunications. She said the AEA recently published a small survey that projected the market for telecommunications software would grow by 2.5 times its current level over the next five years. Kildall asked what was driving that. Hubbard said telecommunications was no longer driven by a single company–AT&T–but now drew the interests of all kinds of electronic and information technology companies worldwide.

Kildall asked Hamlin for his views on the hot areas. Hamlin agreed that telecommunications was one. But he said overall, it was software, which was the “language of high technology.” He agreed with Kildall that it still made sense for students to have an overall background in computer science.

Cheifet asked Hubbard what major a college student should pursue if they wanted to get into a field like telecommunications. Hubbard said that posed something of a small problem. AT&T used to train all of the country’s telecommunications engineers, and they weren’t doing that anymore. She said the AEA was actually on the verge of launching a new master’s degree curriculum for telecommunications engineering. But right now, the best preparation was probably an electrical engineering degree.

Kildall noted he’d had difficulty finding qualified engineers himself at Digital Research. So what was the best way to find qualified people? Hamlin said that was basically what his company did. It was a dedicated project to find such people. An employer had to give him a “very accurate specification” of what they wanted. It then took him 30 to 90 days to find a qualified person. Most of the candidates he looked at were referred to him by others.

Kildall noted that Silicon Valley tended to promote a “checkerboard” career with people moving from one job to another in rapid succession. Hamlin added that the typical lifespan of a project, from conception to production, was roughly 2 to 3 years. (It used to be 5 years.) So when one project was completed, an engineer was usually ready to proceed to something else. Kildall suggested an engineer should then view his career as a bunch of roughly six-year “segments.” Hamlin said that was not inconceivable, as the goal was for an engineer to learn and acquire new technologies rather than doing the same job over and over again.

Cheifet wanted to know more about the “geography” of job opportunities–i.e., Were we only talking about careers in Silicon Valley? Hubbard said California remained the main hotbed of computer-related jobs, with 4 or 5 of the top-10 geographic markets. Indeed, the entire Pacific, including Oregon and Washington–and even Alaska and Hawaii–were a hotbed. The other major hubs after that included Massachusetts and Texas. She said Virginia was also a developing area, particularly near the Wasington, D.C., area. She also pointed to North Carolina’s “Research Triangle” and the emerging “Technology Crescent” near Atlanta.

Kildall noted that many high-profile tech founders–such as Bill Gates, Steve Wozniak, and Steve Jobs–were college dropouts. So how important was a college education to entering the hi-tech industry? Hubbard said it was still very important. She noted technology was becoming so complex that a sound theoretical base combined with the pursuit of continuing education to avoid job obsolescence was still the best path for most people.

Cheifet asked Hubbard more specifically about opportunities for women in the computer field. She said that while women were going into computer science, they were seemingly not as interested in computer engineering or electrical engineering. She suspected one reason for this was a lack of female role models in the classroom. There were very few female and minority professors in engineering.

Cheifet pointed out there was also a shortage of teachers in these fields. Hubbard agreed, noting there was currently a 16 percent shortage nationwide in computer engineering faculty. That was in spite of the fact that salaries were rising. And in California, the need was enormous, so there were plenty of job opportunities in teaching.

More Complexity = More Jobs?

George Morrow’s closing commentary focused on what he called the “law of diminishing returns on complexity.” By this, he meant that the labor burden of a machine increased in direct proportion to its complexity while the labor benefit decreased. In other words, if Machine A was twice as complex as Machine B, then Machine A would only replace half the labor force as Machine B while using twice as much labor to maintain. In the context of computers, he said the complexity of today’s machines had created enough maintenance and repair jobs to reduce national employment by about half.

E-mail Starting at 40 Cents a Page!

Stewart Cheifet presented this week’s “Random Access,” recorded in early March 1986.

- Hewlett-Packard announced its own line of RISC-based computers, which it claimed would be faster and cheaper than IBM’s RT PC. H-P called its new technology “precision architecture” and the company was “staking its future” on the project. Cheifet noted the first H-P RISC machines would not be out until the fall of 1986 and were expected to cost $225,000.
- Some engineers believed that RISC machines would be very difficult to write software for and the chips themselves were less reliable.
- Digital Equipment Corporation kicked off its third-annual DECworld conference in Boston. DEC announced a new local-area network system called DEC Connect, which allowed a single digital wall plug to accommodate four separate feeds: hi-speed data, lo-speed data, voice, and video.
- AT&T announced a new low-price e-mail system that would cost 40 cents to send a one-page letter. (Cheifet noted that a postage stamp cost 22 cents.) AT&T would also offer “delivered e-mail” to recipients without computers starting at $7.50 for overnight delivery.
- At the recent Solid State Circuits Conference in Anaheim, California, Hitachi showed off a new Josephson Junction chip that performed a

calculation in trillionths of a second. NEC displayed a new RAM chip that the company claimed operated at 25 billionths of a second. AT&T demonstrated a chip that claimed to move 3 billion bits per second. And IBM said its experimental microprocessor had 93,000 transistors on the chip and could literally run a mainframe program on a desktop computer. (For comparison, Apple's recently announced M2 chip has 20 *billion* transistors.)
- The General Services Administration completed a survey of computer use by the federal government. The most widely used applications by government workers were spreadsheets. Respondents said the biggest benefit of computer usage was "more timely output." And the biggest complaint was "inadequate training."
- The Denver Public Library developed an "electronic atlas." A user could enter criteria into a database and get answers to questions. Cheifet noted there were about a thousand variables such as census figures, demographics, and business locations.
- International Robomation, a manufacturer of bar code readers, demonstrated the reliability of its product by putting a bar code on a Frisbee and throwing it. The barcode scanner still managed to accurately read the data.

Private Equity Managed to Destroy Heald College

There were no products in this episode, so instead I'll briefly discuss one of the featured locations, San Francisco's Heald College. Edward Payson Heald started the for-profit college in 1863. Originally known as "Heald's Business College," it claimed to be the first college in the western United States focusing on "instruction in commercial subjects" for both men and women, according to a 1928 advertisement touting the school's 65th anniversary. Heald created a companion school for engineering and mining in 1875.

Larry Barton, a former Heald College president, wrote in a 2014 article that when he took over in 2000, the school "boasted 12 campuses in California, Oregon and Hawaii, serving over 1,000 students at each," over 80 percent of whom were minorities. But Barton said that Heald College's financial success–driven largely by federally backed student loans–eventually drew the interest of private equity funds.

In 2007, an unnamed private equity group acquired Heald College under the name Heald Capital LLC. Two years later, in 2009, Corinthian Colleges Inc. purchased Heald Capital for $385 million in cash. Founded in 1995, Corinthian basically gobbled up vocational schools like Heald and tried to grow them rapidly. But as Barton noted, Corinthian had a "rich history for alleged deceptive practices in recruiting and delivering education."

In 2013, U.S. Vice President Kamala Harris, then California's attorney general, launched an investigation of Corinthian's various colleges, including Heald. Harris filed a lawsuit accusing the company of using deceptive marketing tactics that targeted low-income students with false promises of job placement. The U.S. Department of Education and Consumer Financial Protection Bureau subsequently launched their own inquiries.

By 2015, the Department of education suspended Corinthian's access to federal student loans. This effectively brought the entire scheme crashing down. After receiving a $30 million fine in connection with its management of Heald College, Corinthian abruptly closed the college down in April 2015. Corinthian and its multiple subsidiaries filed for bankruptcy shortly thereafter. To add insult to injury, in 2016 a California Superior Court judge ruled in favor of the Attorney General's office in their original lawsuit, adding a (largely ceremonial) $1.1 billion civil judgment to the defunct Corinthian's debts.

At the time of Heald's closure, the Department of Education announced that students who attended the school during Corinthian's tenure would be eligible for an "expedited" debt relief process. But just a couple of weeks before I wrote this post–June 1, 2022–the Department of Education announced that it would "discharge all remaining federal student loans borrowed to attend any campus owned or operated by Corinthian Colleges Inc."

It Was Basically the Late ’80s Version of Apple’s WWDC

Another small item that caught my attention was Stewart Cheifet’s mention of Digital Equipment Corporation’s “DECworld” conference. While it may not sound like a big deal now, DECworld ’86 drew about 16,000 business executives and 4,000 Digital Equipment Corporation employees to Boston. DEC claimed the five-day, invitation-only event cost $4 million and was the “world’s largest single-company computer exposition held to date.”

The conference took up three hotels in Boston, which were all connected via a temporary local area network constructed by DEC According to Wendy Woods’ *Newsbytes*, the setup included “[h]undreds of DEC computers ranging from Rainbows to high-end VAXes” tied together by Ethernet. The temporary LAN also tied into DEC’s internal network, EasiNet, enabling 30,000 of the company’s employees outside of Boston to attend sessions remotely.

While DECworld was not open to the public, it was partially broadcast on local television. DEC purchased time on two local UHF stations in Boston and Manchester, New Hampshire, that aired nightly, half-hour highlights packages from the conference. This was primarily for the benefit of DEC employees in New England who could not attend in-person. (The *Boston Globe* noted that DEC decided to preempt reruns of “The Flying Nun” and “WKRP in Cincinnati” but not “Star Trek,” as the company acknowledged many of its employees were fans of the latter.)

As for product announcements, *Newsbytes* said DEC failed to fulfill rumors of new PC compatibles but did unveil updated versions of its DECtalk voice synthesizer as well as “[s]everal information-management and decision-support packages for the VAX.”

Notes from the Random Access File

- This episode is available at the Internet Archive and had an original broadcast date of March 4, 1986.

- John Podkomorski retired from Hewlett-Packard in 2006 after 30 years with the company.
- Pat Hill Hubbard remained with the American Electronics Association as a vice president until 1997. She went on to co-found the Ciocca Center for Innovation and Entrepreneurship at Santa Clara University, where she served as the director until 2002.
- Timothy Knapp spent more than 20 years as an administrator with Heald College, leaving his position as vice president of admissions in 1997. In recent years he's owned a number of small tech-related companies, including DataGreen, a California firm that helps homeowners perform cost-benefit analyses for installing solar panel systems.
- That experimental IBM microprocessor was known as the IBM Micro/370. The CPU Shack Museum has a detailed write-up of this chip's development history. The Micro/370 was never actually put into production, as IBM decided to go with the Intel 80386 as the base for its next generation of minicomputers. (Thanks to Ed S on Mastodon for pointing me to this article.)

Chapter 20: The FPS-264, ELXSI 6400, Sequent Balance 8000, and the WARP Project

Since the mid-2000s, just about every personal computer made contains a multi-core and/or multi-threaded CPU. These are both practical applications of parallel processing technology, which was still in its infancy back in March 1986 when this next *Computer Chronicles* episode aired. At this point, parallel processing was largely the domain of expensive "super" minicomputers that were marketed as less-expensive alternatives–relatively speaking–to traditional mainframes.

Stewart and Gary Playing with Their Trains

In his cold open, recorded at Pittsburgh's Carnegie Mellon University, Stewart Cheifet showed a video camera that was part of a computerized vision system attempting to mimic the human brain by processing millions of pieces of information in milliseconds. Sequential computers couldn't handle that kind of speed, he said, so computer scientists needed to develop computers that worked more like the human brain in terms of parallel processing.

Back in the studio, Cheifet and Gary Kildall used toy trains to illustrate the concept of parallel processing. Cheifet explained that in a sequential computer you basically had one "train" on one "track" carrying one instruction or piece of information. But in a parallel system you could have two or more engines, each carrying some information, down separate tracks, meaning the job could get done twice as fast.

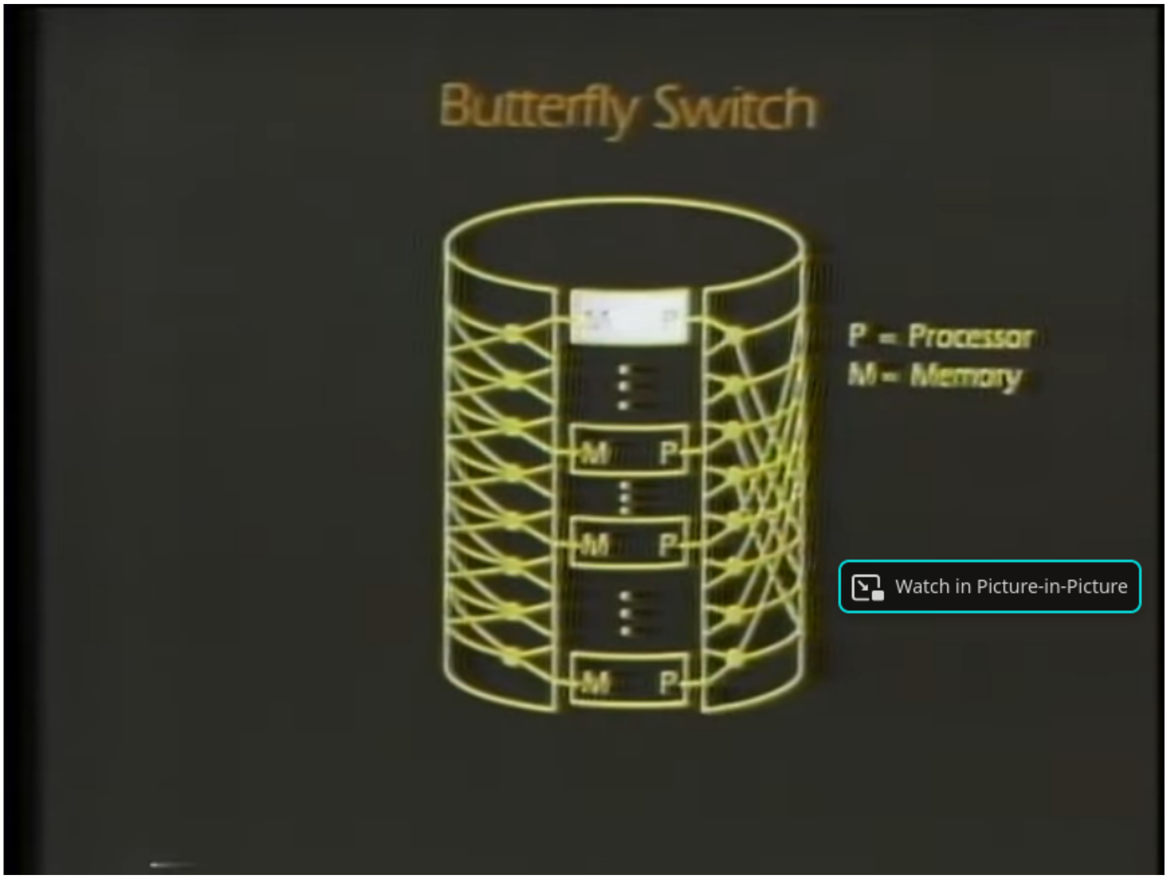
Cheifet asked Kildall if he was "on the right track" with that analogy. Kildall said it was a good model. The basic idea was to take a complicated task and break it down into smaller, independent tasks that could be carried out at the same time. For example, if you wanted to move 1,000 people down that train track, you could use several trains to move them down one track by making separate trips. Or you could have several trains running on parallel tracks take all 1,000 people down the track at nearly the same time. The problem was how to coordinate the trains.

Kildall added that personal computers already ran multiple processes in parallel using different processors. For example, there was one microprocessor monitoring the keyboard and recording keystrokes, another in the printer that buffered and printed data, and a CPU coordinating all those processes independently.

64-Bit Machine Offered “Remarkable” Graphics to Researchers

Wendy Woods’ first segment offered a broad overview of the concepts behind parallel processing. Over some B-roll footage, Woods said that towering over the minis and mainframes were supercomputers like the Cray X-MP. Of course, the Cray cost tens of millions of dollars. But the widespread interest in parallel architecture could change that.

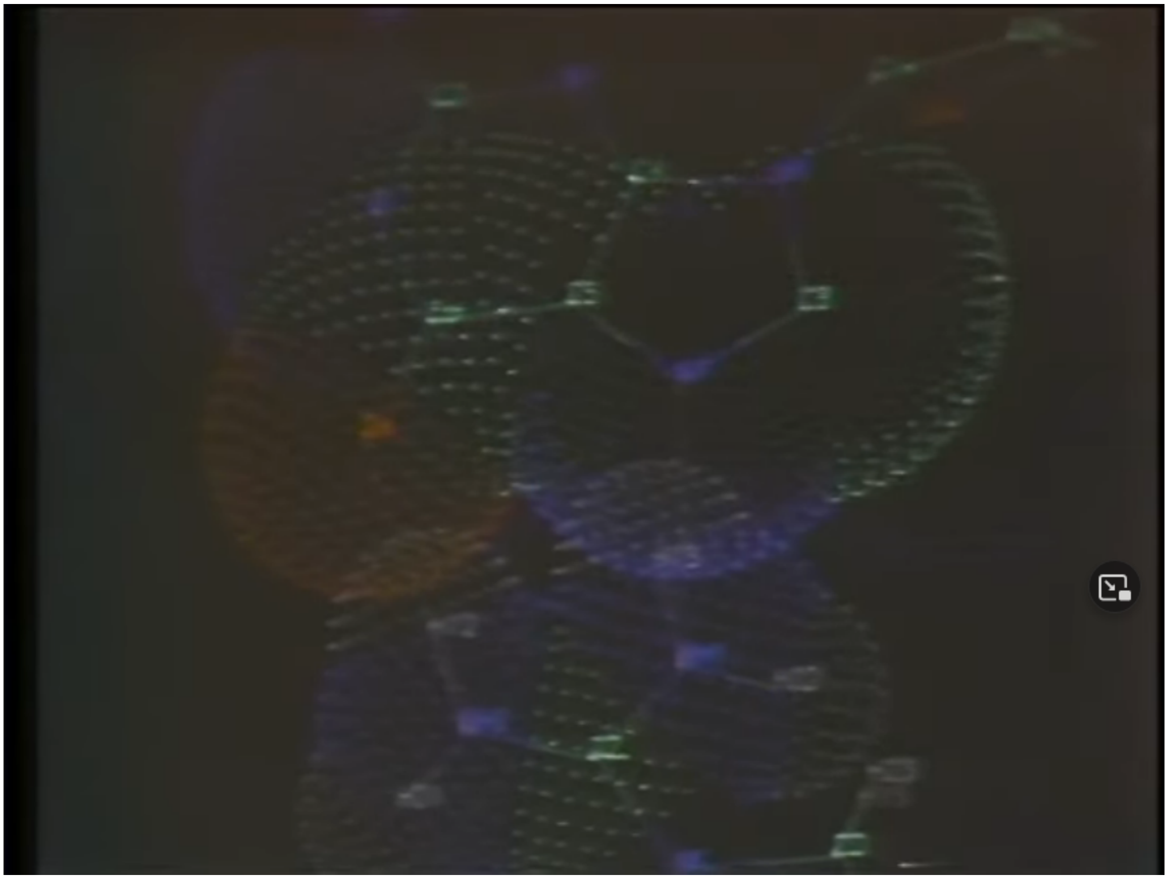
Parallel processing–i.e., the dividing up of computations between processors working in unison–could be accomplished in different ways, Woods said. The *data bus* was the most common method but only effective for a limited number of processors. The *distributed crossbar* was another way to divide up the processing, although the need to interconnect each processor with one another placed a practical limit on that system as well. Finally, there was the *butterfly switch* network, which could expand the crossbar to include up to 256 processors (see below).



A graphical model of a Butterfly Switch. It resembles a cylinder showing the interconnection of multiple processors and memory.

But regardless of the method used, Woods said, these multi-processor “superminis” were giving new number-crunching power to specialized users. For example, the University of California-San Francisco recently installed a Floating Point Systems FPS-264, a parallel processing machine that the school used for molecular modeling studies. The 64-bit machine was capable of 38 million floating point operations per second (FLOPS), which could reduce a night’s worth of calculations to just a couple of hours.

Woods noted the FPS-264 produced some of the most remarkable graphics ever seen on a computer (see below).



A sample image from a FPS-264 computer. There is a collage of red, green, and blue spheres and interconnecting lines.

Could Parallel Processing Bring Computers Closer to the Human Brain?

Dr. Howard Resnikoff and Dr. Eugene Brooks III joined Cheifet and Kildall for the first of three studio round tables. Resnikoff was a visiting scientist at MIT specializing in biological information processing and also worked with Thinking Machines Corporation, a supercomputer company. Brooks was a physicist at the Lawrence Livermore National Laboratory.

Kildall opened by asking Resnikoff what his work in biology had to do with parallel processing. Resnikoff said the most “proficient” parallel information processors were biological organisms. For example, if you drove your car down the street and a child ran out in front of you, within one-tenth of a second your brain would respond and have your foot aimed at the brake. To break it down, light hit your eye and traveled up the optic nerve. Your brain then created a plan, compared the information with stored knowledge, and sent signals to your motor system to move your muscles. The neurons in your brain switched in a millisecond and thus required parallel processing.

Kildall turned to Brooks and asked him a similar question about how parallel processing applied to his work. Brooks said parallelism did two things. First, it reduced the cost of using simulations to solve a problem. That is, it allowed the lab to use several cheaper computers in running that simulation as opposed to one more expensive computer. Second, parallel processing reduced the time it took to run the actual simulation. In order for simulations to be useful, the physicist had to get answers back quickly enough so they didn't forget what problem they were trying to solve.

Kildall asked for an example of a typical physics problem. Brooks said weather simulations and simulations of the deformation of metals were two common examples. Kildall interjected and asked how parallelism might specifically be useful in a weather simulation. Brooks said that type of simulation required dividing a physical space into a large number of zones. The process of updating the physical characteristics of each zone could then be done in parallel rather than having to do them one-at-a-time in sequence.

Cheifet asked Brooks how much faster parallel processing actually worked. Brooks said the factor in speed was difficult to ascertain. If you updated thousands or millions of data points in something like a weather simulation, the cost of organizing all those parallel computations could interfere with the effective use of parallelism. So there was only a certain range of parallelism that you could exploit efficiently.

Cheifet asked Resnikoff if he could see parallel processing applied to a field like artificial intelligence. Resnikoff said we'd begun to see that already. He cited machine vision (which Cheifet mentioned in his cold open) as one potential application. Resnikoff said you had to realize the amount of computing resources required for such tasks was much greater than any sequential computer could offer today. The human eye, for instance, received the equivalent of 2,500 MB of data per second. No computer available today could deal with that.

Cheifet noted that Brooks worked with a parallel processing machine called the Hypercube when he worked at the California Institute of Technology. What approach did the Hypercube use? Brooks said it was a "message-passing" architecture where you used multiple CPUs connected to each other. These CPUs then sent "computer mail" to one another to get the work done. The data of the algorithm had to be distributed among all the CPUs by the programmer.

Cheifet asked Resnikoff to elaborate further on the human brain as an analogy to a parallel computer. Resnikoff said this was a “very complicated question.” He noted that we still knew very little about how the brain actually worked. Some scientists believed the brain may contain 10 to the 12th power number of neurons. Electronics would not build machines that complex, he said, so the more fundamental question was how to structure the programs, which was where most progress would be made.

Parallel Personal Computers by 2000?

Wendy Woods’ second segment focused on the ELXSI 6400, a parallel processing minicomputer developed by Elxsi Corporation in San Jose, California. Woods said Elxsi’s president, P. Appleton Jones, predicted that all computers would be parallel processing machines by the year 2000. As for the 6400, it was currently capable of running 12 CPUs simultaneously. Jones told Woods that Elxsi had already sold the ELXSI 6400 to 60 major customers. For example, he said General Motors was now using parallel processing to design car bodies, and the semiconductor industry was doing the same with respect to chip design. He said parallel processing allowed these companies to obtain the same calculations for one-quarter the price of using a single-processor computer.

Woods said that parallel processing didn’t come cheap. A top-of-the-line ELXSI 6400 cost nearly $3 million. But Jones said he expected the prices would come down as the industry realized the potential. He reiterated his view that personal computers used in business would be parallel machines within the next 10 to 15 years. It was the “natural step” to take once you accepted the limitations of sequential processing.

Woods said Elxsi sold $22 million in hardware in 1985, which wasn’t bad for a company pioneering a new technology. And in 1986, the company not only expected to break even but also show a profit over its initial investment. After that, the sky was the limit. (Spoiler: It wasn’t.)

Sequent Displayed the Power of a Dozen CPUs

David Rodgers, vice president of engineering for Sequent Computer Corporation, joined Cheifet and Kildall in the studio. Dr. Howard Resnikoff also remained with the panel.

Kildall asked Resnikoff if the train analogy used in the beginning of the episode was really an accurate model for parallelism. Resnikoff said it was a good model, albeit not perfect. The more complicated the problem, the more the processors had to communicate with one another, and the topology of the network was thus critical.

Cheifet asked Rodgers for a demonstration of his company's parallel processing machine, the Sequent Balance 8000. (The actual machine was running to the side of the studio; a display monitor was on the desk.) Rodgers said his on-screen demo showed a sample computation–the Mandelbrot set–which could be divided into parallel segments. The Balance 8000 had a total of 12 processors, which meant the individual segments could be processed 12 at a time. To illustrate the difference in speed, the Sequent calculated the Mandelbrot set starting with just one processor, then two, and finally all 12.

Rodgers said that someone generally wanted to accomplish one of two results with parallel processing. Either they obtained a decrease in run-time–they obtained the results more quickly–or there was an improvement in throughput.

Kildall asked for more information about the Sequent's architecture and how it differed from, say, the Hypercube discussed earlier with Eugene Brooks. Rodgers said the Hypercube was an example of a "connection" machine. i.e., a network of computers talking to one another but not sharing the same memory. In contrast, the Balance 8000 was a "closely coupled multiprocessor," where all of the CPUs shared access to the same data at every instant in time. One would use a connection machine for a problem where the rate of communication among the processors was lower and the distribution of data was higher. Conversely, with closely coupled machines one worked on problems where there was more frequent intercommunication and the volume of data was larger.

Kildall asked if there was any application of this technology to personal computers. Rodgers said the recently announced IBM RT PC allowed for parallel computation. Kildall brought up graphics as another application. Rodgers said that many machines used for complex tasks like graphics relied upon functional distribution.

Cheifet asked Resnikoff about the approach taken by his company, Thinking Machines. Resnikoff said Thinking Machines made a connection machine with 64,000 processors, each of which was a relatively simple one. For a machine like that, which operated in a special control mode, graphics and image processing problems could be treated in a manner similar to the 12-processor Sequent 8000 but on a “much more massive scale.”

Cheifet asked Rodgers to elaborate on the specific applications of the Sequent machine. Rodgers said in terms of runtime applications it was much along the lines of the demo he showed–graphical applications and simulation of physical systems. The throughput-oriented applications tended to focus on transactions, such as large numbers of people accessing the same database.

Carnegie Mellon Researchers Proceeding at Warp Speed

Stewart Cheifet presented the third and final remote segment for the week, a report from Carnegie Mellon University (CMU), where he also did the cold open at the beginning of the episode. Cheifet quipped that on *Star Trek*, when Captain Kirk told Scotty to set the engines at “warp speed,” you knew that meant he wanted the Enterprise to go fast. Similarly, when CMU started its WARP Project, it wanted computers that wanted to go fast–which meant using parallel processing.

Cheifet said the computer scientists at CMU were trying to build a parallel machine that could provide the computer power needed for vision processing, which was essential to the future of robotics. Because vision processing was easily divided up into separate computations, it seemed ideal for parallel processing and the localized memory approach of the WARP machine.

Vision processing required tremendous speed just to do the filtering necessary to eliminate erroneous images, Cheifet said, such as shadows or debris. A vision processor thus needed to perform 20 calculations per-pixel per-second. With a typical matrix of 250,000 pixels, that meant 5 million computations per second–far beyond the speed of today’s sequential computers.

Dr. Hsiang-Tsung (H.T.) Kung, the head of CMU’s WARP Project, told Cheifet that building the machine was the easy part. The difficult part was figuring out how to actually use the hardware. Kung’s approach was therefore to build a parallel machine with a very simple architecture, which made the machine easier to program and build more complex software on top of.

Cheifet said that to be useful in vision processing, the WARP machine not only had to recognize what it saw, it had to first translate the distorted images from its lens into the normal linear aspect ratio. And that computation required tremendous speed, because the image was constantly changing as the computer scanned its environment.

The usual method of attaining computer speed, Cheifet noted, was the supercomputer approach used by Cray. But Kung said the parallel approach was superior. He told Cheifet this was the difference between doing things very fast on a very big piece of hardware (the supercomputer) versus doing it on a small piece of hardware (a parallel machine). He added the smaller machine would also be more adaptable for new uses as it could be easily moved to the places where it was needed.

Cheifet said one of the next big steps for the WARP Project was to use very large scale integration (VLSI), which would reduce the size of the necessary processor boards to a mere 2-by-4 inches. With that level of integration, Kung said it was only a matter of time before you found parallel processing in your microcomputer. That meant personal computer users would have access to technologies like vision processing.

Growing the Commercial Market for Parallel Machines

For the final studio round table, Craig Mundie and Jeffrey Canin joined Cheifet and Kildall. Mundie was a co-founder and vice president of product development at Alliant Computer Systems, a Massachusetts-based manufacturer of parallel systems. Canin was an analyst with Hambrecht & Quist, a San Francisco investment bank.

Kildall asked Mundie about Alliant’s approach to parallel processing. Mundie said it differently slightly from that of Sequent or the Hypercube. Alliant’s goal was to produce a range of products that would be used in engineering computing within a price range of roughly $100,000 to $1 million. More importantly, he said the goal was to provide a form of “transparent” parallel processing, which meant people with existing applications–typically coded in FORTRAN–could port them from existing single-processor machines to run on Alliant’s parallel processing machine without needing to redevelop their application.

Kildall said it seemed difficult to pull this off, given that a FORTRAN program typically wasn’t written with parallel processing in mind. Mundie agreed that it was difficult. It required some state-of-the-art development, both in compiler technology and the actual low-level machine architecture.

Kildall asked Mundie what a sample customer for Alliant looked like. Mundie said a number of Fortune 500 companies, specifically those with research and development labs, had purchased Alliant machines. Specifically, he said companies in telephony and aerospace used parallel processing for a range of applications from finite element modeling to speech synthesis and analysis.

Cheifet turned to Canin and asked him if there was now a viable commercial market for parallel processing machines. Canin said we were already starting to see some commercial successes in this market. It had been very long in promises and a lot of vendors were now trying to get into the market.

Cheifet asked Mundie about the consequences of parallel processing for the typical PC user. Mundie said one consequence was that technical computing was now becoming "bimodally distributed." (In other words, technical problems could now be designed and solved on an individual workstation.) He added that thanks to networking, parallel machines with much higher performance were now being used in a server role.

Kildall asked if we'd need to change how we program to use parallel machines effectively. Mundie said it depended on the class of machine. Something like the Hypercube would probably require new programming languages or at least new programming techniques. Alliant's goal was to get "reasonable efficiency" as you added more processors, even for older languages like FORTRAN. So he thought both approaches would be used going forward.

Because we haven't brought up the Japanese in awhile, Cheifet asked how their efforts in parallel processing compared with the work going on in the United States. Canin said the American companies were taking the lead in this particular market. The bulk of the Japanese market was at the higher end, i.e., supercomputers.

Cheifet said his impression of parallel processing was that the hardware was ahead of the software. Did more needed to be done to find ways to use this technology? Mundie said there had been significant progress lately in both hardware and software. Kildall noted that the emphasis in parallel processing seemed to be on scientific uses. Would we start to see more business applications? Mundie said yes, especially in the area of database management. He added that companies like Alliant and Sequent focused on the high-performance engineering and scientific area partly due to market conditions, and partly because the technology was more readily applicable to problems in those fields.

IRS Selected Zenith to Fulfill Portable PC Needs

Stewart Cheifet presented this week's "Random Access," which he recorded in March 1986.

- Scientists in the United States and the Soviet Union reached a tentative agreement on a new computer network that would link the Soviet Institute for Automated Systems in Moscow with the New Jersey Institute for Technology. Cheifet said this network would allow Soviet and American scientists to share databases and work together on research projects.
- IBM said its recent price cuts and a "soft market" for capital spending would reduce its expected earnings for the first quarter of 1986.
- The IRS awarded a $28 million contract to Zenith to provide its Z-170 portable computers to the agency. Cheifet said the decision to go with a machine with a 5.25-inch disk drive would help the larger format stay ahead of the 3.5-inch microfloppies.
- The U.S. Senate Governmental Affairs Committee released a report criticizing the federal government's computer security practices. The report said there was "inadequate screening" of computer personnel and a lack of planning with respect to risk analysis.
- The National Science Board released a report stating that U.S. high tech research was basically in good shape but warned of the increasing role of the military in funding research. Cheifet said the biggest weakness identified by the report was a lack of math and science teachers at the high school level.
- A high school in Grand Rapids, Michigan, was now teaching industrial robotics.
- A Fairfield, Iowa, programmer released a speech synthesis program called *Babble 123*, which was designed to talk in a "calming and loving way" to farm hogs.

Parallel Processing Worked…Even If These Four Companies Did Not

This episode featured four companies involved in the parallel processing market in 1986: Alliant, Elxsi, Floating Point Systems (FPS), and Sequent. None of them exist today. Well, one of them still exists, but not as a company having anything to do with computers.

Elxsi Somehow Morphed from Cutting-Edge Computer Company Into Running Diners

The company that still kind-of exists is Elxsi. Joseph D. Rizzi and A. Thampy Thomas founded the original Elxsi in 1979 to produce "superminicomputers" capable of running both UNIX and the company's own proprietary operating system. By 1984, the company had sold about 40 computers total. That may not sound like much but keep in mind these superminis often had seven-figure price tags. For example, in March 1984 Australia's Department of Defence purchased an ELXSI 6400 for $1.6 million, according to the *Sydney Morning Herald*.

In 1985, Elxsi merged with Trilogy Ltd. I previously mentioned this deal in a post about a *Chronicles* 1984 episode where Gene Amdahl appeared as a guest. Amdahl, one of the key people behind IBM's success in the mainframe market, left Big Blue in 1970. He subsequently launched a couple of different startups in an attempt to compete against IBM. Trilogy was one of those efforts.

An unidentified Trilogy employee told the *San Francisco Examiner* in March 1985 that the company had "given up on its attempt" to develop technology that could dislodge IBM's supremacy in the mainframe market. But Trilogy was still flush with cash, so Amdahl and his executives decided to invest in Elxsi's parallel processing machines instead. Amdahl continued as chairman of the combined company–which used the Elxsi name–until 1989, when he resigned in favor of original Elxsi co-founder Rizzi.

As it turned out, Amdahl jumped off a sinking ship. The company had not turned a profit since the first quarter of 1988. In August 1989, Elxsi announced "significant" second quarter losses and laid off 50 percent of its staff. This ended Elxsi's manufacturing operations in the United States. Elxsi continued to conduct operations in Singapore as part of a joint venture with the India-based Tata Group.

The Tata-Elxsi joint venture broke off at this point into its own entity, which actually continues to the present day. Meanwhile, Elxsi sold what was left of its U.S. hardware and software business to Minneapolis-based National Computer Systems, Inc., in November 1989.

That was the end of Elxsi as a computer business but not of the company itself. In September 1989, Milley & Co. purchased a 20 percent stake in Elxsi, which quickly rose to a controlling interest. Milley was a Connecticut-based investment company run by Alexander "Sandy" Milley. Apparently, Elxsi still had one valuable asset left in the form of tax breaks. (I couldn't find a more specific explanation of what these tax breaks were or how they worked.)

Sandy Milley decided to use the shell of Elxsi–and its lucrative tax breaks–to acquire several profitable (but under-performing) companies via leveraged buyouts. In 1991, the Milley-controlled Elxsi purchased a group of 42 restaurants from Marriott Corp., operating under the Bickford's Family Restaurant and Howard Johnson's brand names. The following year, Elxsi bought CUES Inc., a company based in Orlando, Florida, that manufactures surveillance cameras and repair equipment for sewer lines.

Brad Kuhn, writing for the *Orlando Sentinel* in 1995, said that Elxsi was at that point primarily a restaurant company–at least in terms of revenues–although Milley focused most of his energies on running the CUES side of the business. Kuhn noted that Milley was never able to fully exploit the original Elxsi tax breaks as the market for leveraged buyouts had slowed.

Milley continued to run his unholy restaurant-and-sewer-camera company well into the 2010s. In April 2018, North Carolina-based SPX Corporation purchased Elxsi and merged it into a subsidiary that retained the Elxsi name. This deal only covered the CUES part of the business. The Bickford's chain is now down to just three restaurants in Massachusetts. Milley still owned those remaining restaurants as of late 2018 but I'm not sure about the current ownership situation.

Mundie Enjoyed Long Career at Microsoft Following Alliant's Demise

Alliant Computer Systems only lasted a decade. Craig Mundie co-founded the company with Ron Gruner and Rich McAndrew in 1982. This wasn't mentioned in the episode, but Jeff Canin's firm, Hambrecht & Quist, was one of the venture capital funds that backed Alliant's initial business plan. (Another backer was former *Chronicles* guest John Doerr of Kleiner Perkins.)

According to Jessica Livingston, who interviewed Gruner for her 2007 book *Founders at Work: Stories of Startups' Early Days*, Alliant raised an initial $30 million to build "very high-performance computer systems that provided a growth path from [Digital Equipment Corporation's] VAX lines of machines, which were topping out at half a million dollars." It took three years for Alliant to actually bring a product to market. Alliant subsequently went public in December 1986 with Hambrecht handling the offering along with Morgan Stanley.

Gruner told Livingston that Alliant grew quickly–reaching a market valuation of nearly $500 million–but then the company "hit the wall" for a couple of reasons. First, Alliant was late in shipping one of its next-generation computers. And by that point, high-performance computers had become "the ultimate commodity," with competitors quickly exceeding Alliant's price-performance ratio. Second, the end of the Cold War led to a decline in purchases from defense contractors, who made up a significant portion of Alliant's customer base.

In February 1991, Alliant's board fired Gruner as chief executive officer. Mundie, by then the company's president, took over the CEO's role as well. Alliant continued to introduce new products, including a November 1991 announcement of a "massively parallel supercomputer" with 800 Intel CPUs that cost $16 million. But it was apparently too little (or perhaps too much) too late. In May 1992, Alliant laid off 75 percent of its employees and filed for Chapter 11 bankruptcy. The company never emerged from bankruptcy, however, and ended up selling off its remaining assets.

Mundie left Alliant in December 1992 to join Microsoft as general manager of its advanced consumer technologies division. He would spend more than 20 years at the company, retiring as chief research and strategy officer in December 2014. Mundie subsequently formed a consulting company.

Floating Point Research Fell to Cray–and Ultimately Silicon Graphics

Floating Point Systems began in 1970. As the name suggests, FPS originally designed and manufactured specialty minicomputers that performed complex floating-point calculations. Based on a 1978 *Barron's* report discussing the company's public offering, the major uses for FPS machines included "radar and sonar processing, seismic analysis for energy exploration and, not least, CAT scanners."

By 1986, the Oregon-based FPS claimed to have the "world's fastest supercomputer," thanks to its parallel processing technology. But sales of these new machines, known as the T-series, were slow to say the least. By the end of

1989, FPS stock fell to $1.83 per share, which represented an 80 percent drop from the company's initial public offering 10 years earlier. The New York Stock Exchange suspended trading in FPS altogether in September 1991. FPS filed for Chapter 11 bankruptcy and the company's founder and CEO, C. Norman Winningstad, retired a few days later.

Shortly after Winningstad's departure, supercomputer giant Cray Research signed a letter of intent to purchase FPS. The negotiations were apparently contentious, with Cray publicly backing out of the deal in mid-November 1991 before finally reaching an agreement with the judge overseeing the bankruptcy case. In December 1991, Cray formally acquired the assets of FPS for $3.25 million. Steve Gross of the *Minneapolis Star-Tribune* reported that "Cray has never said precisely why it wanted to acquire FPS," but speculation was that Cray might have been interested in the specific type of microprocessors FPS used in its machines, which were the same as those used in Cray's workstations.

In any event, FPS ceased to exist after the purchase and became an Oregon-based subsidiary of Cray that continued to produce machines for the business market. Four years later, in 1996, Silicon Graphics Inc. (SGI) acquired Cray and shut down the Oregon unit. The *Star-Tribune* noted that SGI already made high-end business servers and viewed the former FPS product line as redundant.

Sequent Assimilated by Big Blue

Sequent Computer Systems lasted longer than the other companies discussed above, almost (but not quite) making it to the year 2000. It also got the latest start of the four companies. The company began under the name Sequel–later changed to Sequent–in 1983 when 17 Intel engineers led by Casey Powell left the company to form their own startup. At the time, the *New York Times* noted, the new company had "no clear notion of what it would make."

Eventually, the group produced the Sequent Balance 8000 seen in this episode. The Balance was a 32-bit UNIX machine. After partnering with Oracle Corporation, Sequent enjoyed substantial success in the high-end UNIX market during the late 1980s and 1990s.

In July 1999, IBM purchased Sequent for $810 million in cash. Big Blue quickly assimilated Sequent into its existing server division, which by that time was moving from UNIX to Linux-based machines. By 2001, the Associated Press reported, "just about everybody and every symbol of Sequent [was] gone." A number of former Sequent employees told the AP that IBM had “botched” the integration of their company leading to an “exodus of top talent and a steep decline in sales of Sequent’s hardware.”

Notes from the Random Access File

- This episode is available at the Internet Archive and has an original broadcast date of March 11, 1986.
- Howard L. Resnikoff (1937 - 2018) enrolled as a student at MIT when he was just 16. After earning his doctorate in mathematics from Berkley in 1963, he worked in academia for the next two decades, holding faculty and administrative positions at MIT, Rice University, Harvard, and the University of California, Irvine. As noted in this episode, Resnikoff was also a co-founder of Thinking Machines Corporation. In 1986, he founded another company, Aware, Inc., where he also served as CEO. Resnikoff died in 2018 at the age of 80.
- Eugene Brooks remained with the Lawrence Livermore National Laboratory well into the 2010s. A 1990 *New York Times* profile noted that Brooks’ Hypercube design “was widely copied in the computer industry” during the late 1980s.
- P. Appleton Jones, who served as Elxsi’s president when this episode aired, later joined Kendall Square Research Corporation, a Massachusetts-based supercomputer company, as an executive vice president. Kendall Square collapsed in 1993 after the company’s auditors found executives were misreporting their sales figures. This led to a Securities and Exchange Commission (SEC) investigation. In 1996, Jones agreed to pay the SEC a $321,526 penalty–later reduced to $40,000–and was barred from serving as a senior officer of a public company for 10 years.
- David Rodgers remained with Sequent as a vice president until 1996. He then had a four-year stint at Compaq as vice president of business applications before bouncing around a number of web technology companies during the 2000s. His most recent position was a senior vice president with ShotSpotter Inc., which ended in 2019.
- H.T. Kung moved from Carnegie Mellon to Harvard in 1992. Kung remains at Harvard today as the William H. Gates Professor of Computer Science and Electrical Engineering. Kung’s WARP research led to a joint venture between CMU and Intel called iWarp, which built three parallel processing supercomputers between 1989 and 1992.

- Jeff Canin stayed with Hambrecht & Quist until 1989. He continued to work as a technology industry analyst until the mid-1990s when he moved into venture capital.
- *Babble 123* was a real program that you can still run today thanks to the Internet Archive.

About the Author

S.M. Oliva is a freelance writer with over 25 years experience authoring original content for the web. He also spent over a decade working as a paralegal in probate, trusts, and estate planning. If you are looking to hire a freelance blogger or content creator for your own project, please feel free to contact him.